Identifying, Quantifying, and Mapping Food Residuals from Connecticut Businesses and Institutions

An Organics Recycling Planning Tool Using GIS

FINAL REPORT
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EXECUTIVE SUMMARY

This project was undertaken to help improve the climate for recovering and recycling Source-Separated Organic Materials (SSOM) in Connecticut. Source Separated Organic Materials are defined in this project as food wastes from manufacturing, distribution, and/or kitchen operations that can potentially be separated from other wastes at the point of generation. They do not include other recyclable materials that may be generated at these same kinds of facilities, such as cardboard packaging and soiled paper.

At present, the absence of good information on the location of SSOM generators in the state, and on the types and quantities of materials they generate as wastes or byproducts, is a major barrier to the development of SSOM recycling capabilities. This project has sought to address this barrier in three ways:

1. To identify, in as much detail as possible, all of the major food waste generators in Connecticut, including food manufacturers, processors, and distributors, colleges and universities, hospitals and other healthcare institutions, resort/conference facilities, correctional facilities, major private employers, and supermarkets;
2. To quantify and characterize the organic wastes generated by these establishments;
3. To use Geographic Information Systems (GIS) technology to map the location of all identified generators, with technology that allows them to be shown in relationship to transportation arteries at both the statewide and local level, facilitate the identification of logical generator "clusters" for recycling, and facilitate the development of an efficient collection infrastructure.

The products of the project are a food waste generator database for Connecticut businesses and institutions; food waste generation formulas for specific generator categories; and GIS-based capabilities to create and display, on demand, a set of organics "density maps", with the potential to graphically display the concentration of organic wastes in Connecticut by individual generator, by generator type, by waste type, waste quantity, and location. The combination of the organic waste databases with GIS capabilities, which to DEP's knowledge is unique in the United States, allows the user of the generator and generation databases and mapping technology to ask for almost any combination of information about commercially generated organic wastes in Connecticut. It can be used to facilitate decisions about how best to target organics for recovery, which generators to target, how to structure collection routes and infrastructure, and where to site collection and recycling facilities. Lack of information, not technology or economics, has been the most significant barrier to successful organics recycling in Connecticut. It is DEP's hope that the information provided by this project, with the mapping capabilities to bring the information to life, will go a long way toward eliminating this barrier.

NUMBER AND NATURE OF SSOM GENERATORS IN CONNECTICUT

Nine categories of SSOM generators were analyzed in this study. They are summarized in Table ES-1.

Table ES-1
Summary of Connecticut Food Waste Generators Analyzed In This Study

Generator Category	Number	Minimum Size Included in Database
Food Manufacturers / Processors	318	>=5 employees
Food Wholesalers / Distributors	127	>=5 employees
Health Care Facilities	305	Inpatient or residential only, >=$500,000 sales, and >=10 employees
Colleges, Universities	50	All identified establishments included
Independent Schools, Primary and/or Secondary	7	Boarding schools only, >250 students
Correctional Facilities	20	All identified establishments included
Resorts / Conference Facilities	53	Banquet seating for >=250 guests
Supermarkets	304	>$1.5 million sales, or >15 employees
Major Private Employers	130	Not applicable; cutoff established at 130 top private employers ranked by number of employees.
TOTAL	**1,314**	

For seven generator categories, a size cutoff was established to limit the number of establishments included in the generator database. The rationale for excluding smaller establishments is straightforward — although they may constitute a large number of individual generators, they individually produce very small quantities of wastes, and collectively produce a relatively small proportion of all organic wastes measured on a statewide basis. With these characteristics, they typically are not commercially attractive targets for food waste recycling, and it was decided that to include them in the generator databases and maps would add unnecessary and unproductive clutter to the results of this analysis. The size cutoffs established for each generator category are presented in Table ES-1. These cutoffs resulted in removal from the SSOM generator database of approximately 210 small manufacturers/processors, 410 small wholesalers and/or distributors, 200 small delicatessens, 120 convenience stores, 735 small food stores with fewer than 15 employees or less than $1.5 million in annual sales, and 325 small health care establishments.

SSOM GENERATION RATES BY GENERATOR CATEGORY

A major goal of this project has been to develop the means to develop organic waste generation estimates as a function of facility size, sales, number of employees, or other readily available metrics. Based on literature review and survey information acquired directly from Connecticut SSOM generators, this has proven possible for six of the nine generator categories, including health care facilities, colleges and universities, independent preparatory schools, correctional facilities, resort and conference facilities, and supermarkets. Table ES-2 summarizes the relationships established for each of these generator categories.

Table ES-2
Food Waste Generation Estimates by Generator Category

Health Care Facilities

Food waste (lbs/yr) = N of beds * 5.7 meals/bed/day * 0.6 lbs food waste/meal * 365 days/yr

Colleges, Universities, and Independent Preparatory Schools

Residential Institutions

Food waste (lbs/yr) = 0.35 lbs/meal * N of students * 405 meals/student/yr

Non-Residential Institutions (e.g., community colleges)

Food waste (lbs/yr) = 0.35 lbs/meal * N of students * 108 meals/student/yr

Correctional Facilities

Food waste (lbs/yr) = l.0 lb/inmate/day * N of inmates * 365 days/yr

Resorts / Conference Facilities

Food waste (lbs/yr) = 1.0 lbs/meal * N of meals/seat/day[1] * N of seats * 365 days/yr

Supermarkets

Food waste (lbs/year) = N of employees * 3,000 lbs/employee/yr

Notes:

[1] Resort and conference facilities were divided into two classes, depending on how intensively they use their banquet/dining facilities. One has been given a value of 0.6 meals/day/seat of conference capacity, the other a value of 0.25 meals/day/seat of conference capacity.

For the reasons described below, such relationships have not been possible to develop for three generator categories: food manufacturers and processors, food wholesalers and distributors, and major private employers.

Food Manufacturers/Processors. Even within a single SIC code, manufacturers are very diverse. For example, one meat packer (SIC 2011) may purchase and process entire carcasses, and ultimately discard half or more by weight as waste. A neighboring facility in the same SIC may purchase partially processed cuts of meat, and discard only a few percent as a waste. Similar disparities in operations can be found across all manufacturing and processing categories. Waste generation estimates for the population of Connecticut generators analyzed in this category were based on survey responses secured from individual generators.

Food Wholesalers/Distributors. Two aspects of wholesale and distributing operations affect waste generation but are not reflected in SIC information or in available data on facility size. These are (1) the

amount of intermediate processing carried out at an individual facility, and (2) the handling of surplus or returned items. Some wholesalers and distributors carry out extensive pre-processing or intermediate processing operations (e.g., ripening bananas or fruit, preparing fish or shellfish for distribution), with commensurately high waste generation, while others simply warehouse and redistribute pre-packaged items, with essentially zero waste. A similar situation applies to the treatment of spoiled, surplus, or returned items. Some distributors dispose of these items, generating a significant waste stream, while others (who may share the same SIC classification), return all of these items to their manufacturers, and generate essentially zero organic wastes. As a result, it is not possible to predict waste generation as a function of any readily available data on facility size, sales, employment, or similar parameters, and the waste generation estimates derived for this study are based on individual survey contacts with Connecticut wholesale and distribution establishments.

Major Private Employers. Employers vary substantially in the nature of food service they provide for employees, and equally in the amount of waste they generate. Based on survey responses from major Connecticut firms, a large proportion have no cafeteria facilities and generate no organic waste. Some have food brought in pre-prepared by a caterer, with any associated food waste generated at the catering establishment. Among responding facilities that serve meals on site and provided waste generation estimates, the number of meals served ranged from 50 to 3,000 per day, and the quantity of food waste generated ranged from 10 pounds/day to 20 cubic yards/day. Among the data reported, there is no discernible relationship between the number of meals served and the quantity of waste generated, nor is there an apparent relationship between the number of meals served and company size.

SSOM COMPOSITION

Data on organic waste composition were derived from an extensive literature search and on survey and phone contacts with individual Connecticut generators. By generator category, waste composition can be summarized as follows:

Food and Beverage Manufacturers and Processors. In general, waste composition is a fairly predictable reflection of the generator SIC category — e.g., meat, bones, and fat from "meat products" SICs, chocolate, starch, nuts, and raisins from "confectionery" SICs, and so on. However, in almost all SICs there are minor, unpredictable contributions from unrelated wastes. For example, a few meat packers report generation of fruit, vegetable, and/or bakery waste (presumably from production of meat pies or similar products), while a few bakers report generation of meat or vegetable wastes (presumably from stuffed pastas or similar items). Again, the one ultimately reliable source of information on waste composition among manufacturers and processors is the individual generator.

Food Wholesalers and Distributors. In this category also, waste types are predicted well by SIC classification (e.g., fruits from fruit distributors, fish and fish products from fish wholesalers, etc.), with the caveat that some establishments generate product-related wastes that are not intuitively related to the facility's primary SIC. For example, facilities classified as "general line grocers" may in fact generate wastes concentrated in a specific kind of organics (e.g., canned goods, pasta), which are not at all predictable from SIC information.

Healthcare Facilities. This "institutional kitchen" waste stream includes, by weight, 50% or more vegetables and fruits and their byproducts, reflecting their relatively high moisture content, with most of the balance divided between meat (including fish and poultry) and bakery products. There is relatively little dairy reported in this waste stream, presumably because most dairy products are either packaged in single-servings, or are dispensed from bulk containers, in either case generating little source-separated waste.

Colleges, Universities, and Major Independent Secondary Schools. SSOM generated from this generator category is equivalent to that from a health care setting, including 50+% fruit and vegetable matter, with most of the balance divided between meat and bakery products, and a small contribution from sugars and starches, oil-based products, and miscellaneous scraps.

Correctional Facilities. Food waste from this generator category is similar to that from other institutional kitchens (e.g., hospitals, colleges and universities), with the exception that no metallic objects are found as contaminants.

Major Resort and Conference Facilities. Food waste from this generator category is similar to that from other institutional kitchens (e.g., hospitals, colleges and universities), consisting of fruits and vegetables (50+%), meat, fish and poultry wastes, and bakery products.

Major Private Employers. Where on-site food service is provided, wastes from this generator category are similar to those from other institutional kitchens.

Supermarkets. Supermarket organic wastes are dominated by produce. A typical composition study (Jacob 1993) reports that 90% of wastes from eight supermarkets consisted of fruits and vegetables. Between 5% and 6% consisted of bakery wastes, three percent of seafood, and one percent of deli wastes (primarily meat scraps). (Meat wastes are almost universally directed to rendering, and are rarely included in composition studies focused on compostable wastes.)

SSOM GENERATION ESTIMATES FROM GENERATORS ANALYZED IN THIS STUDY

The quantity of SSOM generated annually in Connecticut from the subset of all Connecticut food waste generators that was analyzed in this study is estimated to be between 99,000 and 159,000 tons/year (Table ES-3). The range of estimates is explained by the treatment of the Manufacturer/Processor and Wholesaler/Distributor categories, in that using mean waste generation values in these categories yields a significantly larger total waste generation estimate than using median waste generation values, because of the presence of a small number of very large generators who inflate the mean waste generation estimates.

Table ES-3
Summary of Connecticut SSOM Generation from Generators Analyzed in Study

Generator Category	Number of Establish-ments Generating SSOM	Total SSOM Generation (tons/yr)		SSOM Generation Per Establishment (tons/yr)	
		Mean	Median	Mean	Median
Manufacturers / Processors	318	58,359	4,864	184	15
Wholesalers / Distributors	127	1,592	702	12	5
Health Care Facilities	305	19,783		64	
Colleges, Universities	50	4,645		95	
Independent Preparatory Schools	7	480		69	
Correctional Institutions	20	3,100		155	
Resorts / Conference Facilities	53	14,843		280[1]	
Supermarkets	304	50,529		164	
Major Private Employers	130	Not Estimated		Not Estimated	
TOTAL	1,314	**153,331**	**98,946**	**Not Applicable**	

Notes:
[1]Over 80% of this tonnage is contributed by two facilities. Excluding these facilities, the mean annual tonnage per resort/conference facility is 51 tons/facility/year.

It bears repeating that the goal of this study has not been to estimate total organic waste generation from commercial and institutional generators in Connecticut. As outlined above, in order to limit the number of data points managed and to identify those generators of most interest to a potential population of haulers and processors, a size cutoff was established for six of the nine generator categories analyzed. Therefore, the waste generation estimates in this study account only for that subset of generators in each category larger than the established size cutoffs, and not for all waste generated.

GEOGRAPHIC INFORMATION SYSTEM CAPABILITIES

Information about SSOM generators was assembled in a Microsoft Access database to allow for comprehensive facility tracking, research, and data querying. The database is linked to a Geographic Information System (GIS), ArcView version 3.2a, that graphically displays the generators by type, waste type, waste production estimates, and a variety of other attributes on base maps that contain features such as roads and town boundaries. Users of the system can view generator locations at scales ranging from state (1:800,000) to detailed street levels (1:24,000) and immediately obtain generator-specific information on any generator selected (by running the mouse over the generator map point). Customized hard-copy and on-screen maps can be created to display any of the generator's locations with symbols selected and scaled for

any associated attribute data (e.g., size, waste type, etc.). Map ES-1 is an example of one of the basic maps that can be created with this software, portraying all food manufacturers and processors tabulated for this project.

Queries can be performed to select generators within a certain area, defined with on-screen graphics or by data attributes such as town, zip code or street. This type of query is particularly useful for determining preliminary waste generation estimates for specific areas. By selecting generators and running a GIS summing routine, total quantities of waste can be determined. The detailed, street level maps are also useful for preliminary route mapping for waste collection. The ability to spatially select and easily obtain the attributes of generators is a powerful tool for assessing the feasibility of developing SSOM processing facilities. User specified reports can be generated easily.

Map ES-2 provides an example of the system's data querying capabilities. It illustrates a set of queries that might be developed by a hauler or composter interested in sourcing SSOM for a processing facility in the Hartford area. First, the user might request a map of all generators of organic waste within 10 miles of Hartford (Map ES-2(1)). If a user is only interested in facilities that generate vegetable and bakery waste, they can be selected by querying for the appropriate waste type codes (Map ES-2(2)). Seeking to eliminate the smallest generators, the user could then eliminate all of the selected manufacturers and distributors with less than $1 million per year in sales (Map ES-2(3)). Finally, satisfied that a good cluster of related generators does indeed exist in this area, the user could request a map locating these generators on the local street and highway network (Map ES-2(4)), to facilitate the design of an efficient collection and hauling network. In a last step, the user would link from the mapped generators back to the underlying data, where he/she would find detailed information on generator name, street address, size, waste types and quantities, and contact information, and generate a printed report containing this information.

Additionally, the GIS and database query capabilities can be used for the practical task of developing specific organics collection and hauling routes. Having identified a potential cluster of organics generators, an organics hauler or processor could format and download generator data directly into one of several route planning software packages on the market, and so develop efficient collection networks to optimize use of his/her collection vehicles and waste hauling containers.

RESTAURANTS IN HARTFORD COUNTY

Restaurants are the most numerous food waste generators in Connecticut, as they are throughout the country. For a number of reasons, however, very few restaurants recycle their organics, and the number of successfully organized efforts to initiate recycling from a group of restaurants anywhere in the U.S. is very small. There are a number of reasons for this situation, including limited space in most restaurant properties, relatively small size and low SSOM generation rates for most restaurants, difficult internal and external logistics, the hectic pace of restaurant operations, high employee turnover, and difficulty in eliminating contaminants from restaurant-generated SSOM. All of these reasons make capturing SSOM from restaurants a difficult undertaking, likely to succeed only as a local initiative.

For this reason, this project did not attempt a statewide mapping of Connecticut restaurant properties or an analysis of SSOM generation, quantities or composition. Instead, it focused on identifying and mapping restaurants in a single county (Hartford County) to demonstrate the capabilities of the database and GIS mapping combination, and to point the way for similar mapping exercises that could be undertaken in other parts of the state.

Table ES-4 summarizes the 1,614 restaurants identified in Hartford County. Pizza restaurants are by far the most numerous single category, with 239 establishments, or nearly 15% of all Hartford County restaurants. They are followed by fast food and Chinese restaurants (110 and 109 establishments, respectively) and Italian restaurants (94 establishments). The small size of most establishments is also apparent in Table ES-4. Nearly 55% of restaurants that reported sales information have sales of less than $200,000 per year, and another 26% have annual sales between $200,000 and $500,000. Fast food chains constitute about 12% of all Hartford restaurants.

Table ES-4
Hartford County Restaurants by Type and Size (Sales)

SIC	Sales (Million $$)								SIC Description
	<0.2	<0.5	<1.0	<2.5	<5.0	<10.0	Unk.	Total	
5812-0000	125	50	32	20	4	1	170	**402**	Eating places, not characterized
5812-0100	8	1	0	1	0	0	5	**15**	Ethnic food restaurants
5812-0101	16	5	12	5	0	0	17	**55**	American restaurant
5812-0103	58	19	1	0	0	0	31	**109**	Chinese restaurant
5812-0106	4	1	0	0	0	0	0	**5**	Greek restaurant
5812-0107	5	1	1	0	0	0	2	**9**	Indian/Pakistan restaurant
5812-0108	17	27	16	9	0	0	25	**94**	Italian restaurant
5812-0109	5	2	0	0	0	0	3	**10**	Japanese restaurant
5812-0112	0	1	0	0	0	0	7	**8**	Mexican restaurant
5812-0113	3	1	0	0	0	0	0	**4**	Spanish restaurant
5812-0115	3	0	0	0	0	0	0	**3**	Thai restaurant
5812-0116	4	1	0	0	0	0	1	**6**	Vietnamese restaurant
5812-0200	1	1	0	0	0	0	1	**3**	Ice cream, soft drink stands
5812-0201	3	0	0	0	0	0	1	**4**	Concessionaire
5812-0202	1	0	0	0	0	0	0	**1**	Frozen yogurt stand
5812-0203	6	8	0	0	1	0	4	**19**	Ice cream stands or dairy bars
5812-0206	1	0	0	0	0	0	0	**1**	Soft drink stand
5812-0300	1	0	0	0	0	0	1	**2**	Fast food restaurants and stands
5812-0302	2	0	1	0	0	0	0	**3**	Carry-out only (except pizza)
5812-0304	9	4	3	1	0	0	10	**27**	Coffee shop
5812-0305	10	6	2	0	0	0	9	**27**	Delicatessen (eating places)
5812-0306	0	1	1	0	0	0	0	**2**	Drive-in restaurant
5812-0307	1	2	4	9	2	2	90	**110**	Fast-food restaurant, chain
5812-0308	2	0	1	1	0	0	2	**6**	Fast-food restaurant, independent
5812-0309	0	0	0	1	0	0	0	**1**	Food bars

Table ES-4 (continued)
Hartford County Restaurants by Type and Size (Sales)

SIC	Sales (Million $$)								SIC Description
	<0.2	<0.5	<1.0	<2.5	<5.0	<10.0	Unk.	Total	
5812-0310	3	3	1	0	0	0	1	**8**	Grills (eating places)
5812-0311	0	0	0	0	0	0	1	**1**	Hamburger stand
5812-0312	2	0	0	0	0	0	2	**4**	Hot dog stand
5812-0313	15	22	1	0	0	0	25	**63**	Sandwiches and submarines shop
5812-0314	2	2	0	0	0	0	2	**6**	Snack bar
5812-0400	3	1	0	0	0	0	1	**5**	Lunchrooms and cafeterias
5812-0402	5	1	2	0	0	1	8	**17**	Cafeteria
5812-0403	6	2	0	0	0	0	1	**9**	Luncheonette
5812-0405	0	1	1	0	0	0	0	**2**	Restaurant, lunch counter
5812-0500	1	5	5	1	1	0	11	**24**	Family restaurants
5812-0501	0	0	0	3	0	0	50	**53**	Restaurant, family: chain
5812-0502	10	10	5	2	1	0	7	**35**	Restaurant, family: independent
5812-0600	78	27	10	2	0	0	52	**169**	Pizza restaurants
5812-0601	1	5	1	1	0	0	14	**22**	Pizzeria, chain
5812-0602	27	11	3	3	0	0	4	**48**	Pizzeria, independent
5812-0700	5	4	3	1	0	0	2	**15**	Seafood restaurant
5812-0701	0	0	0	0	0	0	1	**1**	Oyster bar
5812-0801	0	0	1	0	1	0	1	**3**	Barbecue restaurant
5812-0802	4	1	1	2	0	0	7	**15**	Steak restaurant
5812-9901	2	1	0	0	0	0	8	**11**	Buffet (eating places)
5812-9902	30	9	2	2	0	0	28	**71**	Café
5812-9903	35	14	6	3	0	0	30	**88**	Caterers
5812-9906	0	0	0	0	0	0	4	**4**	Contract food services
5812-9907	4	7	0	1	0	0	1	**13**	Diner
5812-9909	1	0	0	0	0	0	0	**1**	Health food restaurant
Total	**519**	**257**	**116**	**68**	**10**	**4**	**640**	**1,614**	

Geographically, the distribution of restaurants generally follows the distribution of population in Hartford County. There are no apparent patterns in restaurants' distribution by size, type, or other distinguishing characteristic. If anything, restaurants of similar types (including restaurants in any single chain) tend to be spaced evenly rather than clustered in any way.

CONCLUSIONS

- From the set of 1,314 generators analyzed, this study identified a total of 98,946 to 153,331 tons/year of source separated organic materials (SSOM) potentially suitable for composting or other recycling. Additional tonnage, the quantity of which was not estimated in this study, is generated from a large number of businesses and institutions that are smaller than the size cutoffs established for this analysis.
- Based on the results of this study, enough SSOM is generated in Connecticut to support recycling efforts, either dedicated exclusively to SSOM, or for SSOM mixed and recycled with other organics (e.g., leaf and yard wastes).
- This study is the first of its kind to combine a database of source-separated organic matter generators, database information on the types and quantities of organic materials generated, and Geographic Information System (GIS) technology capable of graphically and flexibly representing this information.
- This combination of database information and GIS technology provides a flexible and powerful tool to identify and characterize SSOM in Connecticut that can be used by current or prospective SSOM recyclers, SSOM generators, haulers, and waste management planners.
- The database and GIS products of this analysis provide the State of Connecticut with an opportunity to create recycling markets for SSOM in Connecticut, and to create jobs and economic activity centered on this recycling opportunity.

LINK TO MAP ES-1

LINK TO MAP ES-2

SECTION ONE

INTRODUCTION

Food-derived organic materials remain one of the most problematical components of the waste stream to recycle. The State of Connecticut has been very successful in developing programs to encourage and implement recycling for grass, leaf and yard wastes, brush, and similar materials. But Connecticut has witnessed very little diversion of food manufacturing and processing residuals, institutional kitchen scraps, supermarket wastes, and other residual or scrap food products.

Connecticut is not alone in this situation. Although the U.S. Environmental Protection Agency (EPA) estimates that food waste comprises about 10% of the U.S. municipal solid waste stream, nowhere in the country has a successful infrastructure for food waste recycling been developed on anything more than a local scale. This is somewhat surprising, given that, on the one hand, organic materials are a heavy and therefore expensive waste stream to handle and dispose of (particularly in a high tipping fee state like Connecticut), and, on the other, proven recycling technologies exist along with strong demand for their products. But development of food waste recycling facilities and diversion of organic wastes continues to lag far behind both available supplies of organics and demand for finished organics-based products. The large majority of organics continue to be discarded, at a very high cost to generators.

Among the biggest barriers to the development of large-scale food waste recycling facilities have been identifying sources and tonnages of food wastes that are available for recovery, planning the collection and transportation network required to recover these materials, and developing adequate organic recycling capacity. Although organic waste generators tend to be clustered in areas that could serve as nodes for cost-effective collection, no single party in the chain from organics generation to ultimate recycling has enough incentive to overcome the economic and logistical hurdles to planning and implementing such an infrastructure. Individually, most generators produce too little organic waste to justify asking and paying for separate collection. Absent demand from generators and recycling options, haulers on their own have little incentive to offer dedicated organics collection. Compost and other recycling facilities typically set a tipping fee at their facility gate, but do not aggressively seek out new sources of organics, much less become involved in the logistical and financial details of bringing them in.

A number of pieces of information are needed to demonstrate that collecting and recycling food-derived organic materials is economically feasible, and, by so doing, to encourage the development of a collection and recycling infrastructure. These include: the density of generators; the types and quantities of organic materials they produce; organizational and other barriers that may hinder organics collection and recycling efforts; and spatial relationships, including relationships to major transportation arteries, that may promote or stymie the design of efficient collection routes. This information is critical to eliminating the barriers that have hindered organics recovery and encouraging the establishment of new collection and recycling programs.

This project has been designed to develop this type of information, using a combination of detailed research on food waste generators throughout Connecticut coupled with Geographic Information Systems (GIS) technology. Specifically, it has had the following objectives:

1. To identify, in as much detail as possible, all of the major food waste generators in Connecticut, including food manufacturers, processors, and distributors, colleges and universities, hospitals and other healthcare institutions, resort/conference facilities, correctional facilities, major private employers, and supermarkets;
2. To quantify and characterize the organic wastes generated by these establishments;
3. To use GIS to map the location of all identified generators, with technology that allows them to be shown in relationship to transportation arteries at both the statewide and local level.

The ultimate products of the project are a food waste generator database for Connecticut businesses and institutions; food waste generation formulas for specific generator categories; and the capability to create and display, on demand, a set of organics "density maps", with the potential to graphically display the concentration of organic wastes in Connecticut by individual generator, by generator type, by waste type, waste quantity, and location. The combination of the organic waste databases with GIS capabilities allows the user of the generator and generation databases and mapping technology to ask for almost any combination of information about commercially generated organic wastes in Connecticut:

- "How much food waste is generated by colleges, universities, and hospitals in Fairfield County?"
- "Show me all the supermarkets within a ten-mile radius of downtown Hartford."
- "How much waste is generated by these supermarkets?"
- "Display all the institutions I could reach with a collection route off Route 34 in New Haven."
- "How much food waste could be available for a compost facility south of Waterbury?"
- "Where are Connecticut's major food manufacturers concentrated, and what types of waste do they produce?"

This information and GIS display capabilities can be used to facilitate decisions about how best to target organics for recovery, which generators to target, how to structure collection routes and infrastructure, and where to site collection and recycling facilities. Information, not technology or economics, has been the most significant barrier to successful organics recycling in Connecticut. It is DEP's hope that the information provided by this project, with the mapping capabilities to bring the information to life, will go a long way toward eliminating this barrier.

SECTION TWO

IDENTIFYING AND SELECTING GENERATOR CATEGORIES

Potential generators of food derived source-separated organic materials (SSOM) range from Fortune 500 manufacturers and processors to street-corner bakeries and delicatessens, from thousand-seat banquet facilities to ten-seat restaurants. It is beyond the scope of this or any practical project to identify and characterize all of these sources. So a decision on which sources and materials to emphasize was a critical early element of the project.

From its inception, a major goal of this project has been to generate results that could be used to promote maximum diversion of SSOM from disposal to a recycling alternative. This goal provided the primary rationale for selecting generator categories for detailed analysis. If too few categories were selected, the project ran the danger of missing large and important sectors of Connecticut's food waste-generating community. If too many categories were selected, the project would be in equal danger of losing its primary goal in a swarm of convenience stores, small town bakeries, and small restaurants. The type of organic materials analyzed was also refined. The definition of "source-separated organic materials" was limited in this study to food wastes that could potentially be separated from the waste stream at the point of generation. It did not include other recyclable organic materials such as soiled paper, wood, and cardboard.

An early decision in the project was to select for analysis generator categories with the following characteristics:

- Generators should be likely to produce a waste stream rich in food residuals that can be easily separated from inorganic wastes or nonrecyclable organic materials.
- Generators should represent a stable population of businesses and institutions;
- Relatively few and relatively large sources would be favored over small, scattered sources.

Using these criteria, and based upon literature review and practical experience in procuring food wastes for recycling facilities, the following generator categories were selected for inclusion;

1. Food and beverage manufacturers and processors with more than five employees;
2. Food wholesalers and distributors with more than five employees;
3. Healthcare facilities (hospitals, nursing homes, intermediate care facilities, rehabilitation hospitals, extended care facilities) -- inpatient or residential facilities only, with >=$500,000 sales, or >=10 employees;
4. Colleges, universities, and major independent secondary schools (boarding schools with at least 250 students);
5. Correctional facilities;
6. Major resort and conference facilities, capable of banquet-style seating for >=250 guests;
7. Supermarkets with over $1.5 million in annual sales, or at least 15 employees;
8. Connecticut's 130 major private employers (which could be expected to operate on-site cafeterias);

The most obvious omission from this statewide roster is restaurants, which were excluded for the following reasons: (1) viewed from the statewide level, they are extremely numerous, scattered, generally small, and subject to frequent turnover; (2) previous research has identified significant barriers to sourcing organics from restaurants. At the local level, however, restaurants are a legitimate subject for "density mapping" and potential sourcing of organics for composting or other recycling. To address that potential, this study applied the "density mapping" approach to restaurants in a single county (Hartford County).

Size cutoffs were established within individual generator categories, as noted above. These boundaries were established based on review of the number and size of food waste-generating establishments in Connecticut, literature review, and practical experience by Draper/Lennon, Inc. in sourcing organics for recycling. Although smaller establishments have not been characterized in detail or included in the maps generated from this project, they are included in the original databases which are the foundation of the density maps, and so are accessible if this project is ultimately extended to encompass a larger generator population. As with restaurants, information on these smaller generators may be of value as an organics-sourcing tool for a local hauler or processor, rather than the statewide level of this analysis.

SECTION THREE

IDENTIFYING AND LOCATING SSOM GENERATORS

The Connecticut SSOM generator database includes 1,314 food waste generators (Table 3-1). Summaries of individual generator categories are provided in Sections 3.1 through 3.8. Appendix A contains a sample database printout, and instructions on electronically accessing the complete generator database.

For seven generator categories, a size cutoff was established to limit the number of establishments included in the generator database. The rationale for excluding smaller establishments is straightforward — although they constitute a large number of individual generators, they individually produce very small quantities of wastes, and collectively produce a small proportion of all organic wastes measured on a statewide basis. With these characteristics, they typically are not commercially attractive targets for food waste recycling, and it was decided that to include them in the generator databases and maps would add an unnecessary and unproductive clutter to the results of this analysis. The size cutoffs established for each generator category are presented in Table 3-1. These cutoffs resulted in removal from the SSOM generator database of approximately 210 manufacturers/processors, 410 wholesalers/distributors, 200 small delicatessens, 120 convenience stores, 735 small food stores with fewer than 15 employees or less than $1.5 million in annual sales, and 325 health care establishments (outpatient clinics, individual practices, nursing homes with less than $0.5 million in annual revenues, etc.).

Data sources and quality control: Information on specific generators was derived from a number of sources, which are discussed below, in the parts of this section relevant to each generator category. The quality of information regarding the number, specific identities, and characteristics of generators in each category is dependent on the quality of information provided by the specified data sources. No independent verification of generator information was attempted as part of this study, and as a result this study makes no warrantees regarding the completeness of data regarding the number of generators in each generator category, or the accuracy of information reported regarding individual generators.

3.1 Food and Beverage Manufacturers and Processors

3.1.1 Data Sources

Information was obtained from three sources:

1. The Connecticut Economic Resource Center (CERC), which has access to a comprehensive database of Connecticut business establishments by Standard Industrial Classification (SIC) code, including information on establishment location, sales, employment, corporate affiliation, and other characteristics;
2. Harris Infosource, a nationwide database of manufacturers which includes information similar to that available through CERC;
3. InfoUSA, a third SIC-based nationwide database of manufacturers and other business establishments.

Information from the three data sources was merged, duplicate entries were eliminated, and the most comprehensive reported information was selected for inclusion in the databases established for this project. No independent quality assurance was attempted on these databases. Each of these sources updates its data continually by phone and mail contact, with most establishments re-contacted on a 6- to 18-month cycle (depending on size). In direct survey follow-ups, we did identify a small proportion of firms (approximately 5%) for which location or contact information was incorrect, which had moved or ceased operations, or which reported operations different from those identified in the industry database(s). No attempt was made, however, to conduct a comprehensive quality assurance check on all of the establishments listed.

3.1.2 Results

Table 3-2 summarizes the population of food manufacturers and processors included in the Connecticut food waste generator database. Bakeries are the most numerous establishment type, with 82 establishments that employ 5 or more workers, followed by dairy product manufacturers, with 44 establishments, and meat and sausage manufacturers, with 40 establishments. Across all types of manufacturing and processing establishments, generators tend to be concentrated in relatively small size classes (less than $5 million in sales).

3.2 Food Wholesalers and Distributors

3.2.1 Data Sources

Databases were obtained from CERC and InfoUSA. See section 3.1.1 for notes regarding the quality and completeness of information obtained from these sources.

3.2.2 Results

Table 3-3 summarizes the 127 food wholesalers and distributors identified in Connecticut. "Unclassified" distributors — i.e., establishments for which detailed information on operations is not available — form the largest single category, with 56 establishments; the remaining establishments are distributed rather evenly among general line groceries, dairy products, fish and seafoods, meat products, and fresh fruit and vegetables. Once again, establishments are concentrated in smaller size classes, with 81 out of 127 facilities generating less than $5 million in annual sales.

Also included in this category are the two concessionaires that prepare food for airlines at Bradley International Airport (Gate Gourmet and Sky Chefs International), bringing the total count defined under this category to 129.

3.3 Healthcare Facilities

3.3.1 Data Sources

Names, locations, and information on establishment size (number of beds, sales, and/or employment) were obtained from a web site (www.chime.org) maintained by the Connecticut Hospital Association (CHA). A search of the CERC database provided information on additional establishments, primarily including nursing homes, rehabilitation hospitals, and similar facilities not covered by CHA.

3.3.2 Results

Table 3-4 summarizes Connecticut's population of health care facilities. A total of 305 establishments with greater than .5 million in sales and 10 employees were identified in Connecticut. The majority are nursing homes, convalescent facilities, hospitals and related institutions.

3.4 Colleges, Universities, and Major Independent Secondary Schools

3.4.1 Data Sources

The Connecticut Department of Higher Education web site (www.ctdhe.org) provided a comprehensive listing of all public and private colleges and universities in the state. Information on school size (number of students) was developed through published sources and contacts with the individual schools. A comprehensive roster of the state's private secondary schools was obtained from the Connecticut Department of Education. Information on location, contact, and size was obtained from the American Schools Directory web site (www.asd.com).

3.4.2 Results

Connecticut has a total of 50 colleges and universities, including 28 serving day students only, and 22 residential campuses (Table 3-5). By far the largest single institution is the University of Connecticut at Storrs, with over 12,000 students. Other major residential campuses include Yale University (5,400 students), Quinnipiac University (4,500 students), Fairfield University (4,100 students), and Sacred Heart University (4,000 students). Among schools primarily or exclusively serving day students, the largest include Central Connecticut State University, Southern Connecticut State University, Tunxis Community College, the University of Hartford, Capital Community College, Norwalk Community College, Three Rivers Community College, all with 5,000 to 10,000 students, and another nine schools serving between 2,000 and 5,000 students.

Seven boarding preparatory institutions were identified in the state, with student populations ranging from 225 to 850.

3.5 Correctional Facilities

3.5.1 Data Sources

Information on the location and size of Connecticut correctional institutions was obtained directly from the CT Department of Corrections.

3.5.2 Results

There are twenty correctional institutions in Connecticut, with a total population of nearly 17,000 inmates. The largest is a 1,800 bed medium-security facility in Somers, CT; the smallest is the maximum security Northern Correctional Institution that is also in Somers, with 472 inmates.

3.6 Major Resort and Conference Facilities

3.6.1 Data Sources

Information on major resort/conference facilities was obtained from the convention and visitors bureau (or equivalent organization) in each of four regions of the state. These included Fairfield County, greater New Haven, greater Hartford, and the Groton/Mystic area. In each region, the visitors bureau provided name and location for all establishments with banquet capabilities to seat more than 250 people.

3.6.2 Results

A total of 53 major resort and/or conference facilities capable of banquet seating for more than 250 guests were identified for this study. The largest single facility is the Foxwoods Casino complex, which serves some 55,000 meals/day, and the Mohegan Sun Casino is also quite large in comparison with most other resort/conference facilities. Other major facilities, capable of accommodating 1,000 or more guests, include the Westin Stamford and Stamford Marriott, and the Hyatt Regency in Greenwich. Remaining facilities include thirteen capable of serving between 500 and 1,000 guests, and 33 capable of serving between 250 and 499 guests.

3.7 Supermarkets

3.7.1 Data Sources

An initial listing of all Connecticut supermarkets, including name, location, type of business (general supermarket, specialty market, convenience store, etc), and size was obtained from CERC. This information was passed on to the Connecticut Food Association, the grocery industry's trade association, which agreed to help DEP secure more detailed information from the major chains active in Connecticut. Contact was established with all chains with three or more store locations in the state. Each chain was asked to verify reported information regarding its stores in Connecticut, and to identify and provide information on stores not included in the CERC database. The supplemental information ultimately provided by most of the major chains included identification of additional stores, as well as more comprehensive information on store size (sales, square footage, and/or number of employees).

3.7.2 Results

Table 3-6 summarizes the distribution by supermarket chain of the establishments captured in the food waste generator database. According to the information developed for this study, there are fourteen chains with three or more stores in Connecticut (stores with 15 or more employees and/or over $1.5 million in annual sales). Stop and Shop is Connecticut's largest chain, with 74 stores, followed by Adams (20 stores), Big Y (18 stores), and Shaws (16 stores). Independent markets, with one and very rarely two locations, account for over one-third of all Connecticut supermarkets (110 establishments).

3.8 Major Private Employers

3.8.1 Data Sources

Information was extracted from two databases, one maintained by CERC, the second maintained by *Connecticut* Magazine (www.connecticutmag.com). Information included company name, estimated sales, location, and a contact.

3.8.2 Results

Connecticut's major private employers span a tremendous range of industry categories, reflecting the diversity of the state's economy, and its status as the headquarters state for many multinational firms. Major industrial firms with production operations as well as headquarters functions in Connecticut include, for example, the United Technologies group of companies (Pratt & Whitney, Sikorsky, Carrier, and others), Black & Decker, Pfizer, and Colts Manufacturing. Other large industrial firms headquarted in Connecticut include General Electric, the Labatt's Group, General Cigar, Olin, Champion International, and Hexcel, among many others. Insurance and financial services remain a strong presence with firms like CIGNA Healthcare, Connecticare, the Hartford Casualty Insurance Co., Mass. Mutual Life Insurance, KPMG, Deloitte Touche, Fleet Bank, and dozens more.

Table 3-1 Summary of Connecticut Food Waste Generators Analyzed in this Study		
Generator Category	**Number**	**Minimum Size Included in Database**
Food Manufacturers / Processors	318	>=5 employees
Food Wholesalers / Distributors	127	>=5 employees
Health Care Facilities	305	Inpatient or residential only, >=$500,000 sales, and >=10 employees
Colleges, Universities	50	All identified establishments included
Independent Schools, Primary and/or Secondary	7	Boarding schools only, >250 students
Correctional Facilities	20	All identified establishments included
Resorts / Conference Facilities	53	Banquet seating for >=250 guests
Supermarkets	304	>$1.5 million sales, or >15 employees
Major Private Employers	130	Not applicable; cutoff established at 130 top private employers ranked by number of employees.
TOTAL	**1,314**	

Table 3-2
Connecticut Food and Beverage Manufacturers and Processors by SIC Code and Size (Sales)

SIC	Sales (Million $$)										Total	SIC Description
	<0.49	.5-.99	1.1-2.49	2.5-4.9	5.0-9.9	10-24.9	25-49.9	50-99.9	>=100	Not Reported		
2011	0	0	2	1	4	7	1	1	0	1	**17**	Meat Packing Plants
2013	1	0	10	2	5	1	2	1	1	0	**23**	Sausages & Meat Products
2015	0	0	0	0	1	0	0	0	0	0	**1**	Poultry Slaughtering, Dressing & Processing
2022	0	1	1	1	0	0	1	0	0	0	**4**	Cheese
2023	1	0	0	0	1	0	0	0	0	0	**2**	Dry, Condensed and Evaporated Dairy Products
2024	0	2	8	2	3	2	2	1	1	7	**28**	Ice Cream
2026	0	0	0	0	1	2	3	1	1	2	**10**	Fluid Milk
2032	1	0	0	0	1	0	0	0	0	0	**2**	Canned Specialties
2033	0	0	0	0	1	0	0	0	1	1	**3**	Canned Fruits, Vegetables & Preserves
2034	0	0	0	0	0	0	0	0	0	3	**3**	Dried and Dehydrated Fruits, Vegetables and Soup Mixes
2035	0	0	1	1	1	0	0	0	0	1	**4**	Pickles, Sauces, and Salad Dressings
2037	0	0	0	0	0	1	1	0	0	0	**2**	Frozen Fruits, Fruit Juices, and Vegetables
2038	1	0	1	0	0	2	0	0	0	3	**7**	Frozen Specialties
2041	0	0	0	0	1	0	1	0	0	2	**4**	Flour, Grain Milling
2045	0	1	1	0	0	0	1	0	0	0	**3**	Prepared Flour Mixes and Dough
2047	0	1	0	1	0	0	0	0	0	0	**2**	Dog and Cat Food
2048	0	0	0	1	0	0	1	0	1	0	**3**	Other Prepared Feeds
2051	4	7	30	2	3	1	1	1	1	32	**82**	Bread, Bakery Products, Cookies & Crackers
2052	3	0	1	0	0	0	0	0	0	5	**9**	Cookies and Crackers
2053	0	0	1	0	0	1	0	0	0	1	**3**	Frozen Bakery Products
2064	1	1	4	1	1	1	1	0	0	3	**13**	Candy and other Confectionery Products
2066	0	0	2	0	1	1	0	0	0	2	**6**	Chocolate and Cocoa Products
2068	0	0	0	1	0	0	0	0	0	0	**1**	Salted & Roasted Nuts & Seeds
2079	0	0	0	0	0	0	1	0	0	1	**2**	Shortening, Oils & Margarine
2082	0	1	1	0	2	0	0	0	0	3	**7**	Malt Beverages
2084	2	0	4	2	0	0	0	0	0	4	**10**	Wine & Brandy
2086	0	0	1	0	0	0	1	1	0	4	**7**	Soft Drinks
2087	0	0	2	1	1	1	1	0	0	1	**7**	Flavoring Extracts & Syrups
2091	0	0	2	0	0	0	0	0	0	1	**3**	Canned and Cured Fish and Seafood
2092	0	0	0	0	0	1	0	0	0	1	**2**	Fresh or Frozen Packaged Fish
2095	0	1	3	1	1	2	0	0	0	3	**11**	Coffee
2096	0	0	0	2	0	0	0	0	1	0	**3**	Potato Chips & Similar Products
2098	1	0	2	1	1	0	0	0	0	1	**6**	Macaroni and Spaghetti
2099	2	1	6	4	2	5	5	0	0	3	**28**	Other Food Preparations
Total	**17**	**16**	**83**	**24**	**31**	**28**	**23**	**6**	**7**	**85**	**318**	

Table 3-3

Connecticut Food Wholesalers and Distributors by SIC Code and Size (Sales)

SIC	Sales (Million $$)											Total	SIC Description
	<0.49	0.5-0.99	1.0-2.49	2.5-4.9	5.0-9.9	10-24.9	25-49.9	50-99.9	100-749	>=750	Not Reported		
5141	0	0	5	0	1	2	2	0	0	1	3	**14**	Groceries, general line
5143	0	1	2	1	0	0	0	0	0	0	4	**8**	Dairy products, except dried or canned
5144	0	0	0	2	2	0	0	0	0	0	0	**4**	Poultry and poultry products
5146	1	0	10	1	3	1	0	0	0	0	0	**16**	Fish and seafood
5147	0	0	4	5	1	1	1	0	0	0	0	**12**	Meats and meat products
5148	2	0	10	2	2	2	2	0	0	0	2	**22**	Fresh fruits and vegetables
5149	3	10	11	9	2	2	0	0	0	1	11	**49**	Other groceries and related products
5153	0	0	2	0	0	0	0	0	0	0	0	**2**	Grain and field beans
Total	**6**	**11**	**44**	**20**	**11**	**8**	**5**	**0**	**0**	**2**	**20**	**127**	

Note: Does not include two foodservice providers at Bradley International Airport

Table 3-4

Connecticut Health Care Facilities by SIC Code and Size (Annual Revenues)

SIC Code	Annual Revenues (Million $$)										Total	SIC Description
	0.5-0.99	1.0-2.49	2.5-4.99	5.0-9.99	10.0-24.9	25.0-49.9	50.0-99.9	100-499	500-1,000	Unknown		
8051	1	15	31	47	8	2	0	0	0	41	**145**	Skilled nursing care facilities
8052	1	0	0	0	1	0	0	0	0	21	**23**	Intermediate care facilities
8059	9	10	27	10	1	1	0	0	0	30	**88**	Nursing and personal care
8062	0	1	0	0	1	3	5	3	1	27	**41**	General medical and surgical hospitals
8063	0	0	1	0	1	0	0	0	0	2	**4**	Psychiatric hospitals
8069	0	0	0	1	0	1	0	0	0	2	**4**	Specialty hospitals, except psychiatric
Total	**11**	**26**	**59**	**58**	**12**	**7**	**5**	**3**	**1**	**123**	**305**	

Table 3-5 Connecticut Colleges and Universities		
	Public[1]	**Private**
Day	22	6
Residential	2	20
Total	24	26
Notes: [1] Includes one U.S. government institution (U.S. Coast Guard Academy)		

Table 3-6

Connecticut Supermarkets by Chain and Size (Number of Employees)

Chain	**Number of Employees**								
	2-4	**5-9**	**10-24**	**25-49**	**50-99**	**100-249**	**>249**	**Not Reported**	**Total**
A Grade	0	0	0	0	0	2	1	0	**3**
A&P (Waldbaum)	0	0	0	0	6	6	0	0	**12**
Adams	0	0	0	0	15	2	0	1	**18**
Better Val-U	0	0	0	1	4	0	0	2	**7**
Big Y	0	0	0	0	1	7	5	6	**19**
Food Mart	0	0	0	0	2	6	0	0	**8**
Geisslers	0	0	0	0	1	2	0	0	**3**
Grand Union	0	0	0	4	5	1	0	0	**10**
IGA	0	0	2	3	7	1	0	0	**13**
Independent	0	1	31	31	32	8	0	4	**107**
Labonnes	0	1	0	2	1	0	0	1	**5**
Shaws	0	0	0	0	0	16	0	0	**16**
Shop Rite	0	1	0	1	1	1	1	3	**8**
Shopwell	0	0	0	0	1	1	0	0	**2**
Stop & Shop	0	0	0	0	3	23	12	35	**73**
Total	**0**	**3**	**33**	**42**	**79**	**76**	**19**	**52**	**304**

SECTION FOUR

QUANTIFYING AND CATEGORIZING SSOM GENERATION

A primary goal of this study has been to quantify the organic wastes from establishments in the eight major generator categories. To make its results as broadly applicable as possible, an initial objective was to relate the quantity and composition of organic wastes to more readily obtainable information on facility operations (specifically, Standard Industrial Classification [SIC]) and size (number of employees, sales, square footage, etc.).

A dual strategy involving direct and secondary research was pursued to develop information on waste generation and the relationship between waste generation, SIC, and establishment size.

Direct research took the form of a letter, press release, and survey requesting information on food waste generation and management that were sent to 100% of identified generators in the following categories: manufacturers / processors; wholesalers and distributors; health care institutions; colleges, universities, and independent schools; resort and conference facilities; and major employers. (Copies of these documents are included as Appendix B). Direct contacts were not initiated with supermarkets or with correctional facilities, because high quality data was available from secondary sources.

Among manufacturers/processors, wholesalers/distributors, health care institutions, and resort and conference facilities, a second survey and/or phone contact was initiated to most or all nonrespondents to gain additional first-hand information on waste generation and management. This approach was not undertaken with colleges and universities or secondary schools, for which initial survey responses and good quality secondary data made it unnecessary to improve on initial survey responses. For reasons outlined in Section 4.8, no additional direct contacts were attempted with the major employers who did not respond to the initial food waste survey.

For all generator categories, secondary research into waste generation quantities and composition included a comprehensive literature review supplemented by contacts with relevant trade associations and professional organizations. Additionally, contacts were established with state and local government and non-government organizations known to have undertaken or sponsored food waste-related research, or to have active food waste recycling initiatives. These included statewide and/or local organizations in Florida, North Carolina, New York, Minnesota, Iowa, Nebraska, Kansas, California, Oregon, and Washington.

It bears repeating that the goal of this study has not been to estimate total organic waste generation from commercial and institutional generators in Connecticut. As outlined in Section 3, in order to limit the number of data points managed and to identify those generators of most interest to a potential population of haulers and processors, a size cutoff was established for seven of the nine generator categories analyzed. Therefore, the waste generation estimates in this section account only for that subset of generators in each category larger than the established size cutoffs, and not for all waste generated in Connecticut.

Table 4-1 summarizes the estimates of food waste generation as they relate to facility size for the following generator categories: healthcare facilities; colleges, universities, and preparatory schools; correctional facilities; resort/conference facilities; and supermarkets. The derivation of these estimates is explained in Sections 4.3 through 4.7. Sections 4.1 and 4.2 describe estimates of waste generation from food manufacturers/processors and food wholesalers/distributors, respectively, and Section 4.8 describes the results of the investigation of food generation from major private employers.

The quantity of SSOM generated annually in Connecticut from the subset of all food waste generators that was analyzed in this study is estimated to be between 98,946 and 153,331 tons/year (Table 4-2). The

derivation of these estimates is explained for each generator category in Sections 4.1 through 4.8. The range of estimates is explained by the treatment of the Manufacturer/Processor and Wholesaler/ Distributor categories. As explained in Sections 4.1 and 4.2, using mean waste generation values in these categories yields a significantly larger total waste generation estimate than using median waste generation values, because of the presence of a small number of very large generators who inflate the mean waste generation estimates.

4.1 Food and Beverage Manufacturers and Processors

4.1.1 Waste Quantities

Waste generation estimates and their derivation for this generator category are shown in Table 4-3. Detailed information on the survey responses which underlie these estimates is provided in Appendix C. Thirty-seven percent of the Connecticut food manufacturer/ processors who responded to the survey indicated that they generate no organic wastes. Of the 63% of generators who reported that they produce organic wastes, the mean quantity generated per week, based on survey responses, ranges from 700 pounds/week in the beverage SIC cluster to 25,000 pounds per week in the bakery SIC cluster. In all SIC groups, however, mean waste generation estimates are skewed by the presence of a few very large generators. For example, median waste generation reported by 29 respondents in the bakery and related SICs is just 750 pounds per week, only 3% of the mean value. Table 4-3 provides waste generation estimates based on both of these values, which are 58,359 tons/year using the mean per establishment value, and 4,864 tons/year using the median per establishment value.

In this generator category, it has not been possible to come up with general relationships between facility size and waste generation. Even within a single SIC code, manufacturers are very diverse. For example, one meat packer (SIC 2011) may purchase and process entire carcasses, and ultimately discard half or more by weight as waste. A neighboring facility in the same SIC may purchase partially processed cuts of meat, and discard only a few percent as a waste. Similar disparities in operations can be found across all manufacturing and processing categories. This situation has been documented by other researchers who have attempted to estimate waste generation from food processing and manufacturing activities (e.g., King County 1995, Nebraska State Recycling Association, 1996; Flores and Shanklin 1998).

For this reason, the GIS map products of this study do not show a direct estimate of waste generation for each establishment. Instead, what is shown on the GIS maps is a representation of facility size as measured in total sales. Within a given SIC code, if other variables are constant, sales is a generally reliable indicator of SSOM generation, and it is the best indicator available for this study. Users of the maps should be aware, however, that great variation in waste quantities is common in SIC codes throughout this category, and that sales is at best a crude predictor waste generation, which ultimately be confirmed by contact and measurement at the individual generating facility.

4.1.2 Waste Composition

The surveys and follow-up conducted for this study provided SIC-specific information on SSOM characteristics from this generator category. Table 4-4 summarizes waste composition reported from the major food processing and manufacturing SIC groups. In general, wastes are a fairly predictable reflection of the generator SIC category — e.g., meat, bones, and fat from “meat products” SICs, chocolate, starch, nuts, and raisins from “confectionery” SICs, and so on. However, in almost all SICs there are minor, unpredictable contributions from unrelated wastes. For example, a few meat packers report generation of fruit, vegetable, and/or bakery waste (presumably from production of meat pies or similar products), while a few bakers report generation of meat or vegetable wastes (presumably from stuffed pastas or similar items). Again, the one ultimately reliable source of information on waste composition among manufacturers and processors is the individual generator.

4.2 Food Wholesalers and Distributors

4.2.1 Waste Quantities

Table 4-5 summarizes per establishment and overall waste generation estimates for the generators analyzed in this category, and detailed information on the survey responses which underlie these estimates is provided in Appendix D. Forty-three percent of survey respondents reported zero organic waste generation. The mean value of respondents who reported waste generation was 1,336 tons/year. As among manufacturers and processors, the median value is much smaller, 583 tons/year (Table 4-5). Including the two additional foodservice facilities at Bradley International Airport, the range of estimates of SSOM generation from the set of generators analyzed is 702 tons/year using the median value, to 1,592 tons/year using the mean value (Table 4-2).

In this category as among manufacturers and processors, it has proven impossible to relate waste generation to sales, employment, or other easy-to-measure yardsticks of facility size. Two major aspects of wholesale and distributing operations affect waste generation but are not reflected in SIC information or in available data on facility size. These are (1) the amount of intermediate processing carried out at an individual facility, and (2) the handling of surplus or returned items. Some wholesalers and distributors carry out extensive pre-processing or intermediate processing operations (e.g., ripening bananas or fruit, preparing fish or shellfish for distribution), with commensurately high waste generation, while others simply warehouse and redistribute pre-packaged items, with essentially zero waste. A similar situation applies to the treatment of spoiled, surplus, or returned items. Some distributors dispose of these items, generating a significant waste stream, while others (who may share the same SIC classification), return all of these items to their manufacturers, and generate essentially zero organic wastes. Overall, 43% of generators in the wholesaler and distributor category reported zero SSOM generation.

As a result, the only meaningful estimate of wholesaler and distributor waste generation comes from site-specific data. And for the reasons outlined in Section 4.1.1, acquisition of such data has been beyond the means of this analysis. For this reason, and because of the unknown number of wholesaler/distributors who generate no SSOM, the waste generation surrogate portrayed on the GIS maps is a representation of establishment sales, although as explained above and in Section 4.1 this is not necessarily a strong predictor of SSOM generated at the facility level.

4.2.2 Waste Composition

Table 4-6 summarizes waste composition reported by wholesalers and distributors who responded to surveys and phone follow-up for this study. Again, waste types are predicted well by SIC classification, with the caveat that some establishments produce product-related wastes that are not intuitively related to the facility's primary SIC.

4.3 Healthcare Facilities

4.3.1 Waste Quantities

A number of independent studies have developed or reported information on organic waste generation and composition for health care facilities based on direct measurement. These include the U.S. Environmental Protection Agency (1998a), Kim et al. (1997), Shanklin et al. (1997), Smith et al. (1998), and the California Integrated Waste Management Board (2001). These were deemed to be more accurate predictors of waste generation in a health care setting than the direct data solicited as part of this study. (These self-reported estimates varied widely, and gave evidence that the institutions had little accurate knowledge of the quantity of wastes they produced.) The estimates from these studies converge on a quantity of approximately 0.6 pounds of organic waste generated per meal served. This was the basic food waste generation estimate used in this analysis.

A second value is required to convert waste generated per meal into an estimate of annual waste generation; this is the number of meals served per year. Absent comprehensive information regarding this variable, a second conversion was made between the number of beds at a facility (which was determined from published information or phone contacts) and the number of meals served. Data from seven institutions surveyed during this study provided a range of values between 4.1 meals served per day per bed and 7.4 meals served per day per bed, with a mean value of 5.7 meals served per day per bed, and a median value of 5.6 meals per day per bed. (That this value is greater than three meals per day per bed reflects the large number of staff and visitor meals prepared and served.) The average value of 5.7 meals/day/bed was used to predict total food waste generation, as follows:

Food waste (lbs/yr) = (N of beds) * (5.7 meals/bed/day) * (0.6 lbs food waste/meal) * (365 days/yr)

Using this equation, total SSOM generation from generators analyzed in the health care category is estimated to be 19,783 tons/year, an average of 64 tons/year per facility (Table 4-2).

4.3.2 Waste Composition

None of the literature reviewed as part of this analysis provided a quantitative breakdown of the composition of SSOM generated from food preparation in an institutional setting. The general composition reported is consistent across a wide number of reports (e.g., King County 1995, Block 1997, Marion 2000). However this “institutional kitchen” waste stream includes, by weight, 50% or more vegetables and fruits and their byproducts, reflecting their relatively high moisture content, with most of the balance divided between meat (including fish and poultry) and bakery products. There is relatively little dairy reported in this waste stream, presumably because most dairy products are either packaged in single-servings, or are dispensed from bulk containers, in either case generating little source-separated waste.

4.4 Colleges, Universities, and Major Independent Secondary Schools

4.4.1 Waste Quantities

Several of the studies cited above, and others as well, have reported information on food waste generation from college and university dining facilities. These include U.S. Environmental Protection Agency (1998d), Kim et al. (1997), Shanklin et al. (1997), Smith et al. (1998), the California Integrated Waste Management Board (2001), and Clark & Law (2000). These have most commonly reported waste generation per meal served, with values ranging from 0.27 lbs/meal to 0.73 lbs/meal, a mean value of 0.39 lbs/meal, and a median value of 0.34 lbs/meal. A value of 0.35 lbs/meal, between the mean and median literature values, was used to estimate food waste generation for this study. This value was

judged to be more accurate than the information self-reported by Connecticut institutions that provided information for this study.

Again, an estimate of the number of meals served per year was required to convert food waste generated per meal to total food waste generated per year. Meals served per year were estimated as a function of enrollment, dependent also on whether a school is classified as a residential or non-residential institution. Seven residential institutions provided data that generated a mean estimate of 1.5 meals served per student per day (range: 0.66 meals/student-day - 2.98 meals/student-day; median = 1.38 meals/student-day). Assuming that food service operates 270 days a year, this generates an estimate of 405 meals served per enrolled student per year for residential institutions. Five non-residential institutions provided data with a mean value of approximately 0.4 meals/student-day (range: 0.17 meals/student-day - 0.96 meals/student-day; median = 0.29 meals/student-day). Assuming the same value for food service activity on 270 days out of the year, this generates an estimate of 108 meals served per enrolled student per year for non-residential institutions.

Using these values, food waste generation from colleges, universities, and independent preparatory schools was estimated as follows:

Food waste (residential) (lbs/yr) = 0.35 lbs/meal * N of students * 405 meals/student/yr

Food waste (non-residential) (lbs/yr) = 0.35 lbs/meal * N of students * 108 meals/student/yr

Based on these estimates, Connecticut's 50 colleges and universities are estimated to generate a total of 4,645 tons per year of SSOM, or an average of 95 tons/year per institution (Table 4-2). The State's seven independent preparatory boarding schools generate an estimated 480 tons/year of SSOM, or 69 tons/year per school (Table 4-2).

4.4.2 Waste Composition

Food scraps generated from this generator category are equivalent to those from a health care setting, including 50+% fruit and vegetable matter, with most of the balance divided between meat and bakery products, and a small contribution from sugars and starches, oil-based products, and miscellaneous scraps.

4.5 Correctional Facilities

4.5.1 Waste Quantities

The State of New York has been the most active in the U.S. in promoting food waste recycling at its correctional facilities, and has developed quite detailed information on waste generation. Marion (2000) reports mean recoverable food waste generation of approximately one pound per inmate per day from a cross-section of New York correctional facilities, and this value is supported by Connecticut data collected from a prison food waste composting program at the 2,700-inmate, 3-facility Enfield prison complex (Block 1997). This value was used for this study, allowing annual waste generation to be calculated as follows:

Food waste (lbs/yr) = l.0 lb/inmate/day * N of inmates * 365 days/yr

With 20 correctional facilities and nearly 17,000 inmates in the state, total statewide SSOM generation from this category is estimated to be 3,100 tons/year (Table 4-2).

4.5.2 Waste Composition

Food waste composition from this generator category is similar to that from other institutional kitchens (e.g., hospitals, colleges and universities), with the exception that no metallic objects are found as contaminants in correctional facility wastes.

4.6 Major Resort and Conference Facilities

4.6.1 Waste Quantities

Resort and conference facilities generate wastes during meal preparation, from leftover portions, and from plate scrapings. In composition these waste are essentially identical to wastes from other institutional kitchens (e.g., colleges and universities, health care establishments). However, because of the nature of their operations, the quantity of waste generated from resort/conference foodservice has been found consistently to be somewhat greater than the quantity of wastes from these other kitchens (Farrell 1995, Kim et al. 1997, U.S. EPA 1997b). Based on available literature data, the value used for this study is 1.0 pounds of food waste per meal served.

The number of meals served by any facility is a function both of its size (sit-down seating capacity) and its capacity utilization — the proportion of its seats that are filled on a daily, monthly, or annual basis. This proportion varies widely. A casino like the Foxwoods resort may serve a stable and predictable number of meals from week to week and month to month, while a summer or winter resort may prepare 60% or 70% of its annual meals served in an eight- or ten-week season. Business convention and conference facilities may have an intermediate and very different pattern.

A review of the dozen establishments that responded individually for this study revealed a general split between facilities that make intensive use of their sit-down eating capabilities and those that don't. Among those that do, estimates of the number of meals clustered around 0.6 meals served per available seat per day. Among facilities that made less intensive use of their facilities, self-provided estimates were substantially less, around 0.2 to 0.3 meals served per available seat per day. On the basis of this information, conference and resort facilities were divided into two classes, one assigned a value of 0.6 meals/day/seat of conference capacity, the other a value of 0.25 meals/day/seat of conference capacity. Individual establishments were assigned to one or the other category based on a review of published and promotional literature and web sites. When the number of meals served per seat per day by each facility was determined, food waste generation was calculated as follows:

Food waste (lbs/yr) = 1.0 lbs/meal * N of meals/seat/day * N of seats * 365 days/yr

Using this relationship, total SSOM generation from the 53 hotel/resort/conference facilities counted in this study is approximately 14,800 tons per year. It should be noted, however, that nearly 80% of this total is contributed by one facility, the Foxwoods casino, which serves some 55,000 meals daily and generates an estimated 10,000 tons/year of SSOM, and an additional 2,200 tons per year comes from the Mohegan Sun casino. Eliminating these two facilities, average waste generation from the remaining resort/conference facilities analyzed in this study is 51 tons/year per facility, or a total of approximately 2,500 tons/year (Table 4-2).

4.6.2 Waste Composition

Food waste from this generator category is similar to that from other institutional kitchens (e.g., hospitals, colleges and universities), consisting of fruits and vegetables (50+%), meat, fish and poultry wastes, and bakery products.

4.7 Supermarkets

4.7.1 Waste Quantities

Supermarket waste generation has been studied extensively (e.g., King County 1995, Newell et al. 1993, Jacob 1993, Newell and Snyder 1996, Grocery Industry Committee on Solid Waste 1991) (Table 4-7). Nearly all studies have related organic waste generation to one of three variables: number of employees (generally expressed as full-time equivalents, or FTEs); gross sales; or gross store size (expressed in square feet). In the data available for this study, number of employees was the data item that was available for nearly all of the supermarkets recorded in the generator database. This, therefore, is the parameter on which this study's estimates of supermarket waste generation have been based. From these literature values, the predictive equation for supermarket waste generation is as follows:

Food waste (lbs/year) = N of employees * 3,000 lbs/employee/yr

After manufacturers and processors, supermarkets are estimated to be Connecticut's second most important SSOM generator category, with over 300 establishments in this study producing a total of approximately 50,500 tons per year of SSOM, or 164 tons/year per establishment (Table 4-2).

4.7.2 Waste Composition

Supermarket organic wastes are dominated by produce. Jacob (1993) reports that 90% of wastes from eight supermarkets studied consists of fruits and vegetables. Between 5% and 6% consisted of bakery wastes, three percent of seafood, and one percent of deli wastes (primarily meat scraps). (Meat wastes are almost universally directed to rendering, and so are not included in composition studies focused on the compostable waste stream.) The Food Marketing Institute (1991) reports that about 48% of compostable waste comes from the produce department, with 15% from bakery, 5% from meat and seafood departments, and 8% from deli. ("Compostable wastes" in this study apparently include waxed and wet cardboard, which would tend to inflate the apparent contribution to food wastes from bakery, meat, deli, and other non-produce departments.)

4.8 Major Private Employers

4.8.1 Waste Quantities

A total of 22 major employers responded to a request for information on cafeteria activity and waste generation, out of 130 surveyed.

Nine out of the twenty reported that they have no cafeteria facilities and generate no organic waste. One other reported that all food is brought in pre-prepared by a caterer, and that any associated food waste is therefore generated at the catering establishment. Among the ten facilities that provided waste generation estimates, the number of meals served ranged from 50 to 3,000 per day, and the quantity of food waste generated ranged from 10 pounds/day to 20 cubic yards/day. Among the data reported, there is no discernible relationship between the number of meals served and the quantity of waste generated, nor is there an apparent relationship between the number of meals served and company size, based on the company size data that was available for this study.

Because of the absence of complete survey responses or reliable waste generation data from secondary sources, it was decided not to attempt to prepare detailed estimates on wastes generated from major employers, and to omit this group as a class to be recorded on the GIS maps output from this study. Their exclusion does not imply that they are not significant generators of waste organics, or that they are

not potentially valuable accounts for an organics recycler or hauler. To the contrary, the data received from several of these firms, coupled with the fact that most or all of Connecticut's major employers are active recyclers of other commodities, suggest that they are a potentially rich and available source of recyclable organics.

4.8.2 Waste Composition

No information was developed on the composition of wastes from major employers. Employers that provide cafeteria meals would presumably generate a waste stream quite similar to wastes from other institutional kitchens (healthcare, resort/conference facilities, etc.). Employers with catered meal facilities generate a very small waste stream of post-plate wastes and unserved portions, again with a similar composition. Employers who offer only vending machine service generate few or no recoverable organic wastes.

Table 4-1
Food Waste Generation Estimates by Generator Category

Health Care Facilities Food waste (lbs/yr) = N of beds * 5.7 meals/bed/day * 0.6 lbs food waste/meal * 365 days/yr
Colleges, Universities, and Independent Preparatory Schools ***Residential Institutions*** Food waste (lbs/yr) = 0.35 lbs/meal * N of students * 405 meals/student/yr ***Non-Residential Institutions (e.g., community colleges)*** Food waste (lbs/yr) = 0.35 lbs/meal * N of students * 108 meals/student/yr
Correctional Facilities Food waste (lbs/yr) = l.0 lb/inmate/day * N of inmates * 365 days/yr
Resorts / Conference Facilities[1] Food waste (lbs/yr) = 1.0 lbs/meal * N of meals/seat/day[1] * N of seats * 365 days/yr
Supermarkets Food waste (lbs/year) = N of employees * 3,000 lbs/employee/yr
Notes: [1] Resort and conference facilities were divided into two classes, depending on how intensively they use their banquet/dining facilities. One has been given a value of 0.6 meals/day/seat of conference capacity, the other a value of 0.25 meals/day/seat of conference capacity.

Table 4-2
Summary of Connecticut SSOM Generation from Generators Analyzed in this Study

Generator Category	Number of Establish-ments Generating SSOM	Total SSOM Generation (tons/yr)		SSOM Generation Per Establishment (tons/yr)	
		Mean	Median	Mean	Median
Manufacturers / Processors	318	58,359	4,864	184	15
Wholesalers / Distributors	127	1,592	702	12	5
Health Care Facilities	305	19,783		64	
Colleges, Universities	50	4,645		95	
Independent Preparatory Schools	7	480		69	
Correctional Institutions	20	3,100		155	
Resorts / Conference Facilities	53	14,843		280[1]	
Supermarkets	304	50,529		164	
Major Employers	130	Not Estimated		Not Estimated	
TOTAL		**153,331**	**98,946**	**Not Applicable**	

Notes:
[1]Over 80% of this tonnage is contributed by two facilities. Excluding these facilities, the mean annual tonnage per resort/conference facility is 51 tons/facility/year.

Table 4-3

SSOM Generation Estimates, Food Manufacturer/Processor Generator Category

SIC	Category	Number in Database	Number Responding to Survey & Followup	Number Reporting Zero Waste	Percent with Zero Waste	Estimated Total Number with Tonnage	**Per Establishment**		**Totals**	
							Reported Mean Lbs/Week	Reported Median Lbs/Week	Calculated Tons/Yr Based on Mean	Calculated Tons/Yr Based on Median
201X	Meat	41	23	8	34.8%	27	1,200	325	834	226
202X	Dairy	44	12	6	50.0%	22	3,400	3,400	1,945	1,945
203X	Fruits, Vegetables	21	11	6	54.5%	10	23,000	1,000	5,708	248
204X	Flour, Feed	12	4	1	25.0%	9	1,030	100	241	23
205X	Bakery	94	29	7	24.1%	71	25,000	750	46,352	1,391
206X	Candy	20	8	3	37.5%	13	3,100	875	1,008	284
208X	Beverages	31	5	1	20.0%	25	700	150	451	97
209X	Misc.	55	11	6	54.5%	25	2,800	1,000	1,820	650
TOTAL		**318**	**103**	**38**	**37%**	**201**	**Not Appl.**	**Not Appl.**	**58,359**	**4,864**

Table 4-4 Summary of Waste Composition by SIC Group, Food and Beverage Manufacturers and Processors		
SIC Group	**Specific SIC Codes**	**Waste Types Reported**
201X: Meat and Meat Products	2011: Meat Packing Plants 2013: Sausages and Meat Products 2015: Poultry Slaughtering, Dressing, Processing 2091: Canned and cured fish and seafood 2092: Fresh or frozen packaged fish	Meat scraps, inedible meat portions Fish and shellfish meat, bones, cartilage Bones Fat Bakery products (minor) Vegetable products (minor)
202X: Dairy Products	2022: Cheese, natural and processed 2023: Dry, condensed and evaporated dairy products 2024: Ice cream and frozen desserts 2026: Fluid milk	Ice cream mixes, ice cream waste Spoiled product Yogurt and toppings
203X: Vegetable Products	2032: Canned specialties 2033: Canned fruits, vegetables, & preserves 2034: Dried fruits, vegetables & soup 2035: Pickles, sauces, and salad dressings 2037: Frozen fruits, fruit juices, and vegetables 2038: Frozen specialties	Tomato products Filter cake Cabbages, potatoes Misc. vegetables and vegetable byproducts Pasta products (minor) Animal fat and grease (minor) Cheese (minor)
204X: Grain Products	2041: Flour and other grain mill products 2045: Prepared flour mixes and doughs 2047: Dog and cat food 2048: Prepared feeds, other	Grain products Egg shells (minor) Vitamins and minerals (minor)
205X: Bakery and Related Products	2051: Bread, cake, and related products 2052: Cookies and crackers 2053: Frozen bakery products 2096: Potato chips and similar snacks 2098: Macaroni, spaghetti & noodles	"Cripple" (off-spec, end-of-run, etc.) Day-old and stale products Pie dough Tortilla chips Potato chips, corn chips, other snack foods Cooked and raw pasta with meat, cheese Fruits and vegetables (minor)
206X: Candy, Confectionery	2064: Candy and other confectionery products 2066: Chocolate and cocoa products 2068: Salted and roasted nuts & seeds	Filter cake Scrap candy and chocolate Sugar waste Nuts, raisins, cherries, cookie bits
208X: Beverages	2082: Malt beverages 2084: Wines, brandy, and brandy spirits 2086: Bottled and canned soft drinks 2087: Flavoring extracts and syrups	Spent brewers grains Grape skins and seeds Concentrated flavors

Table 4-5

SSOM Generation Estimates, Food Wholesaler/Distributor Generator Category

SIC	Category	Number in Database	Number Responding to Survey & Followup	Number Reporting Zero Waste	Percent with Zero Waste	Estimated Total Number with Tonnage	Per Establishment		Totals	
							Reported Mean Lbs/Week	Reported Median Lbs/Week	Calculated Tons/Yr Based on Mean	Calculated Tons/Yr Based on Median
5141	General	14	8	5	63%	5	150	150	20	20
5143	Dairy	8	3	3	100%	0	1,000	1,000	0	0
5144-5147	Meats	32	17	6	35%	21	960	650	517	350
5148	Fruit/Veg	22	7	0	0%	22	360	250	206	143
5149, 5153	Misc	51	19	9	47%	27	850	100	593	70
TOTAL		**127**	**54**	**23**	**43%**	**75**	**Not Appl.**	**Not Appl.**	**1,336**	**583**

Note: Totals do not include two establishments that prepare airline meals at Bradley International Airport

Table 4-6 Summary of Waste Composition by SIC Group, Food Wholesalers and Distributors		
Specific SIC Codes	**Pct Reporting Zero Waste Generation**	**Waste Types Reported**
5141: Groceries, general line	63%	Fresh and spoiled produce Beef fat, bones, damaged dry goods Bakery supplies, canned goods
5143: Dairy products	100%	None reported
5144: Poultry and poultry products 5146: Fish and seafoods 5147: Meats and meat products	35%	Poultry, eggs Fish, lobster, seafood scraps Meat scraps and hides
5148: Fresh fruits and vegetables	0%	Fruits and vegetables Baked goods
5149: Other groceries & related products	47%	Finished and stale baked goods

Table 4-7

Supermarket Food Waste Generation Estimates

Source	Food Waste Generation (tons/employee/yr)	Note
King County 1995	1.43	Survey; Conversion factor developed from CERC data
King County 1995	1.63	Weighing study
Newell et al. 1993	1.42	All stores
Jacob 1993	1.73	Small (20,000 sq ft) stores
Jacob 1993	1.44	Medium (30,000 sq ft) stores
Jacob 1993	1.35	Large (45,000 sq ft) stores
Newell & Snyder 1996	1.46	
Grocery Industry Committee 1991	1.55	Converted from lbs/$1,000 in sales
Grocery Industry Committee 1991	1.37	Converted from lbs/$1,000 in sales

SECTION FIVE

MAPPING SSOM GENERATORS

5.1 SSOM Database and Mapping System

Information about SSOM generators is assembled in an Access database to allow for comprehensive facility tracking, research, and data querying. The database is linked to a Geographic Information System (GIS) that graphically displays the generators by type, waste type, waste production estimates, and a variety of other attributes on base maps that contain features such as roads and town boundaries. Users of the system can view generator locations at scales ranging from state (1:800,000) to detailed street levels (1:24,000) and immediately obtain generator-specific information (Map 1). Customized hard-copy and on-screen maps can be created to display any of the generator's locations with symbols selected and scaled for any associated attribute data (e.g., size, waste type, etc.).

Queries can be performed to select generators within a certain area, defined with on-screen graphics or by data attributes such as town, zip code or street. This type of query is particularly useful for determining preliminary waste generation estimates for specific areas. By selecting generators and running a GIS summing routine, total quantities of waste can be determined. The detailed, street level maps are also useful for preliminary route mapping for waste collection. The ability to spatially select and easily obtain the attributes of generators is a powerful tool for assessing the feasibility of developing SSOM processing facilities. User specified reports can be generated easily. For example, if the user would like to know the names, addresses, waste types and waste generation estimates for all of the generators within a 2 mile radius of downtown Bridgeport, a query can be run and the information printed out immediately. An accompanying map of the area can also be readily created with major roads, local roads or a topographical map base.

With these capabilities, the SSOM database and mapping system is a tool that will provide planners, SSOM recyclers, and waste haulers with valuable spatial and tabular information to facilitate important decisions regarding the identification, collection and processing of organic waste.

5.1.1 Creation of Access Database

The SSOM generator data were obtained and edited by Draper/Lennon. Each data source used slightly different column headings and specific facility type information, such as, *'number of beds'* for hospitals and *'number of inmates'* for prisons. The data were standardized with the most common headings and the pertinent site-specific headings. Additional columns associated with the waste generation were added. These columns include waste types, waste quantity generated, and current disposal practices. Columns for facility location information in latitude and longitude, and state plane X and Y coordinate systems were also added.

The database, named *'SSOM_Database'*, consists of two MS-Access database tables *'SSOM_Generators'* and *'CompostSites'*, for the SSOM generator and Connecticut compost facility data, respectively, and two queries associated with these tables. Appendix E contains the complete listing of database field names and their formats. Important identifying codes created for the Access database include: Category Code (*CatCode*), which identifies the general facility group for each establishment (e.g., institutions = I, food manufacturers = F, etc.); Facility Code (*CTCode*), a unique identifier for each facility in the database, and Data Source Code (*SCode*), for specific numbering based on the data source.

The queries were designed for each of these data tables to allow for the review of user-specified data. These queries contain all of the respective table information. Typical query criteria expressions such as equal to, greater than and less than can be applied to any field in the data table. Multiple criteria can also be applied, such as: City = 'Hartford' and Waste Quantity >'10,000'. The queries are linked to the GIS mapping platform, so the datasets returned from these queries will be reflected in the GIS maps produced.

5.1.2 Creation of GIS Base Map

The software used for this project's GIS mapping is ArcView version 3.2a, a product from the Environmental Systems Research Institute, Inc. (ESRI).

The GIS data used and developed for the project is projected on the Connecticut State Plane coordinate system in feet, using the North American Datum of 1983 (NAD83). This is the standard system used by the CTDEP.

Base map data allow the user to orient the project data in reference to existing spatial information. The base map data layers consist of state and town boundaries and two data layers carrying information about Connecticut roads and highways. The state and town boundary layer is located in the following CTDEP directory: …*\Data\Dep\Basemap\Shapes\Townz.shp*. One of the road network layers is the CTDEP large-scale road data located in the CTDEP GIS directory titled …*\Data\Dep\Basemap\Shapes\Road.shp*. This road data is used for large-scale, town size, viewing of the maps. For the smaller scale maps, countywide and statewide, a selected set of 1994 TIGER/Line road data (compiled by the U.S. Census Bureau) is used to allow for easier viewing of the major transportation routes. The TIGER roads were selected by Census Feature Class Code (CFCC) category and grouped accordingly as follows: TIGER CFCC A10 through A18 - coded as 1 for Highway, CFCC A20 through A28 - coded as 2 for Major Road, and CFCC A30 through A38 - coded as 3 for Town Roads. The viewing scale at which the road base maps change was set to 1:100,000. The TIGER road data is located in the directory …*\Data\Dep\Road\Shapes\roadtgr.shp.*

Since the SSOM generator data is referenced to the same coordinate system as other CTDEP GIS data, any of the state data layers, such as the USGS topographic maps, can be also used for the base map layers.

5.1.3 GIS Data Layer Development

The SSOM generator locations in latitude-longitude coordinates were obtained from the original data source or through a geo-coding process. Geo-coding uses existing geo-referenced road data that contains street number and name information on every road in the United States, including street address numbers and direction and odd versus even sides of the road. The GIS software is able to search all of this road data to find the most logical location for a given address, and record this in latitude-longitude coordinates. Geo-coding was performed with 1994 TIGER/Line data and or with proprietary geo-referenced road line data maintained by Geographic Data Technology (GDT), Inc. For representation on the GIS maps, the geo-coded locations were projected from latitude/longitude to the CT State Plane - feet coordinate system on the NAD83 Datum. The coordinates are included in the database in latitude/longitude by decimal degrees and in X and Y coordinates in the CT State Plane.

Some of the generators that were not successfully located with the geo-coding process were accurately mapped using labels found on the USGS topographic maps. This was effective for hospitals and schools. Additionally, as a quality control check, a random subset of the generator locations provided from the original data sources were checked against geo-coded data to assure the source data were accurate.

The ultimate source of the location data for each SSOM generating establishment is recorded in the database in the field named *'Geostats*' with the codes shown in Table 5-1.

Of the 1,184 SSOM generators mapped in this project, 877 were geo-coded to the street address. 250 facilities were mapped with the coordinates provided from the data source. 30 facility locations were corrected with USGS topographic maps and 16 facility locations were located to the most probable location along the known street. Five facilities were located to the centroid of the five-digit zip code, two were located to the centroid of the five-plus-four zip code, and three were located to the centroid of the five-plus-two zip code. One facility could not be located by any method. Also included in the database are 1,614 restaurants located in Hartford County. Of these, 1,364 restaurants were located by address matching, 241 by

their provided coordinates, and nine did not contain enough information to be located. (As noted in Section Four, the 130 private employers identified were ultimately not included in the generator database or maps.)

5.1.4 Generator Characterization

Table 5-2 summarizes the category codes and related information stored for ten categories of generators held in the generator database.

The CTDEP database of compost sites was imported to the master Access database and merged with the CTDEP GIS shapefile to create a comprehensive database that is linked to the GIS project in the same way as the generators. The *'CompostSites Query*' database query is set to select only the active sites; however, all of the state recorded sites are included in the database. The provided shapefiles contain all of the information from the original CTDEP compost sites database for the active sites. The legend provided identifies the type of solid waste that is composted, site capacity and contact names, among other information

5.1.5 Waste Type Characterization

All SSOM generators have been categorized according to the type(s) of waste they generate, and these waste types are coded in the Access database. The twelve waste types recorded in the database are presented in Table 5-3. These waste codes are used to produce waste type maps.

5.1.6 Current Management Characterization

The database field *'Disposition*' contains codes to identify the current organic waste disposal practices. They are *'R'* for Recycle, *'T'* for Trash, and *'U'* for Unknown. This code is queried from the GIS to retrieve facilities that recycle. In the active GIS, a check mark is mapped on top of the facilities that reported they recycled organics.

5.2 Results

5.2.1 Generator and Waste Type Maps

The base set of maps generated for this project are divided between maps in which **facility type** is the identifying characteristic (four maps), and maps in which **waste type** is the primary identifying characteristic (six maps). Some generators are included in more than one waste type map because they produce multiple products and waste types. All of the generators are included in at least one waste type map and one facility type map. The facility type maps portray facilities labeled by SIC code or general facility category (e.g., College/University, Healthcare Facility). These maps are *"Food and Beverage Manufacturers and Processors"* (Map 2),*"Food Wholesalers and Distributors"* (Map 3), *"Institutions and Resort/Conference Facilities"* (Map 4), *"Restaurants in Hartford County"* (Map 5). There is no map of major private employers (see Section Four).

There are six maps identifying the generated waste types with scaled symbol sizes based on either the *Sales Code* (processors/manufacturers and wholesalers/distributors) or the *Generation Estimate* (healthcare facilities, colleges/universities/independent schools, correctional facilities, resort/conference facilities, supermarkets). These maps are, *"Meat and Fish Waste"* (Map 6), *"Vegetable, Beer & Wine, and Dairy Waste"* (Map 7), *"Bakery, Snack Food, Pasta and Sugar/Starch Waste"* (Map 8), *"Kitchen Waste"* (Map 9), *"Grocery Waste"* (Map 10), *and "Other Waste"*(Map 11). These waste type maps are labeled with a check mark over the facilities that were known to recycle at the time of data collection. The waste types are grouped as outlined above. Restaurants have been mapped separately so the "*Kitchen Waste"* map will not be cluttered. The map *"Organic Waste Generators and Composting Facilities"* (Map 12) contains all of the generators labeled by category and the compost sites labeled by type of facility. *"Active Composting Facilities"* (Map 13) consists of the compost sites only. Two maps, "*Organic Waste Generators, Example of Map Scales*" (Map 1) and "*Example of Database and GIS Query Capabilities*" (Map 14) demonstrate some of the capabilities of the GIS.

5.2.2 GIS ArcView Shapefiles

Twenty static shapefiles (.shp) were created with the current data for each generator category and each waste type and placed in the directory …*Data**Dep**Ssom**Shapes*\ . Legend files (.avl) were created for the generator categories and the waste types. These are also located in the …*Ssom**Shapes*\ directory as well. The legend files are based on facility types and generation quantity. These files will not change with respect to database modifications. The shapefile names and associated legend files are listed in Table 5-4.

5.3 Example of Database and GIS Query Capabilities

The real strong point of the combined database and GIS mapping technologies is that they allow a user to query and display information on Connecticut's SSOM generators in almost infinite combination. This section works through one such combination.

Specifically, Map 14 illustrates a set of queries that might be developed by a hauler or composter interested in sourcing SSOM for a processing facility in the Hartford area. First, the user might request a map of all generators of organic waste within 10 miles of Hartford (Map 14(1)). If a user is only interested in facilities that generate vegetable and bakery waste, they can be selected by querying the 'Waste Code' database field for the appropriate 'V' and 'B' codes (Map 14(2)). Seeking to eliminate the smallest generators, the user could then eliminate all of the selected manufacturers and distributors with less than $1 million per year in sales (Map 14(3). Finally, satisfied that a good cluster of related generators does indeed exist in this area, the user could request a map locating these generators on the local street and highway network (Map 14(4)), to facilitate the design of an efficient collection and hauling network. In a last step, the user would link from the mapped generators back to the underlying data, where he/she would find detailed information on generator name, street address, size, waste types and quantities, and contact information. Using one of the many route planning software packages available on the market, a hauler could use this data to develop the most efficient organics collection route.

This sequence is only one of the many uses to which the SSOM database and GIS mapping technologies can be put. Almost any combination of information on generator type, size, location, waste types, proximity to composting sites, proximity to transportation arteries, and other variables can be pulled from the database and mapped practically instantaneously, with the underlying database information available either on-screen or in a printed report. It is DEP's hope that this combination of detailed generator data and sophisticated mapping and reporting capabilities will find wide use among generators, haulers, composters, and other recyclers, and will help break down a number of information barriers that have been a major impediment to successful SSOM recycling in Connecticut.

Table 5-1 Sources of Location Data in SSOM GIS Maps (Field Name *Geostats*)		
Code	**Description**	**Number**
O	Location data from the original generator data provider. Original coordinates used if address information was not complete or if GDT did not provide matched data. Exception with wholesale and supermarket data - most original location used since close comparison was determined with GDT results (8 to 140 ft)	250
A	Location obtained by address matching the street addresses with geo-coded street maps. Service provided by GDT, Inc.	877
T	Location obtained by geocoding with TIGER street data and refined addresses (yellow pages address searches). Facility locations confirmed with USGS topographical maps where possible. This was especially effective with schools and hospitals.	30
S	Location estimated with street information, either by street and address number where number was not a street data option; or by street where street was relatively short and topographic information supported location.	16
4	Location recorded as the centroid of the 5+4 digit Zip Code	2
2	Location recorded as the centroid of the 5+2 digit Zip Code	3
X	Location recorded as the centroid of the 5 digit Zip Code	5

Table 5-2 SSOM Generator Characterization (CatCode) in Access Database		
Generator Category	***CatCode***	**Notes**
Food Manufacturers/Processors	F	Labeled by SIC code into 31 categories. Legend with sales code indicates size.
Beverage Manufacturers/Processors	B	Labeled by SIC code into 4 categories. Label with sales code indicates size.
Wholesalers/Distributors	W	Labeled by SIC code into 8 categories. Legend with sales code indicates size.
Health Care Facilities	I	*CTCode* beginning with 'H' denotes healthcare facility
Colleges/Universities	I	*CTCode* beginning with 'C' denotes college or university
Independent Preparatory Schools	I	*CTCode* beginning with 'S' denotes independent school
Correctional Facilities	I	*CTCode* beginning with 'P' denotes correctional facility
Resort/Conference Facilities	C	Code in *LocType* field denotes whether conference facility only ('C') or hotel/resort plus conference facility ('H')
Supermarkets	G	Code in *LocType* field denotes whether part of a supermarket chain ('SC') or an independent market ('S')
Restaurants	R	*SIC4Name* specifies the type of restaurant

Table 5-3 Waste Type Codes in the SSOM Generator Access Database	
Waste Type	**Waste Code**
Meat	M
Fish	F
Vegetable / Fruit	V
Sugar, Starch, Confectionery, Chocolate	S
Grains from beer; Skins/Pulp from vineyards	A
Dairy	D
Bakery	B
Pasta	P
Snack Food	J
Institutional Kitchen	I
Supermarket, Grocery Store	G
Other	C

Table 5-4 Static Shapefiles for CT SSOM Maps		
GIS Shapefile Name	**Legend File Name**	**Associated Map**
food.shp	food.avl	2
beverage.shp	beverage.avl	2
wholesalers.shp	wholesalers.avl	3
institutions.shp	institutions.avl institutewaste.avl	4 9
resorts.shp	resorts.avl resortwaste.avl	4 9
restaurants.shp	restaurants.avl	5
recyclers.shp	recyclers.avl	12
meatwaste.shp	meatwaste.avl	6
fishwaste.shp	fishwaste.avl	6
vegwaste.shp	vegwaste.avl	7
bwwaste.shp	bwwaste.avl	7
dairywaste.shp	dairywaste.avl	7
sugstrchwaste.shp	sugstrchwaste.shp	8
bakerywaste.shp	bakerywaste.avl	8
pastawaste.shp	pastawaste.avl	8
snackwaste.shp	snackwaste.avl	8
supermarkets.shp	supermwaste.avl supermarkets.avl	10
otherwaste.shp	otherwaste.avl	11
allgenerators.shp	allgenerators.avl	12
compostsites.shp	compostsites.avl	12 13

SECTION SIX

HARTFORD COUNTY RESTAURANTS

Restaurants are the most numerous food waste generators in Connecticut, as they are throughout the country. As such, and because they are clustered in areas with high population density, they would appear to be logical candidates to target for organized recycling. They also share three common operations — food preparation; food service; and cleanup, which, to all appearances, should simplify the task of organizing them as a group to separate and divert recyclable organics.

Nonetheless, very few restaurants recycle their organics, and the number of successfully organized efforts to initiate recycling from a geographic cluster of restaurants anywhere in the U.S. can practically be counted on one hand. There are a number of reasons for this situation:

- Most restaurants are cramped for space. There is typically little or no room for dedicated collection containers for organics, either inside or outside. Where restaurants choose to recycle other commodities like cardboard and metal containers (or are required to do so, as they are in Connecticut), these space constraints become even more severe.
- The majority of restaurants are quite small, implying both low generation rates for organics, and limited resources to devote to an initiative like recycling.
- Many restaurants are in crowded urban or suburban locations, which impede access for recycling vehicles.
- Most restaurants operate at a hectic pace. With a premium on efficient customer service, there is little time for non-customer-oriented activities like recycling.
- There is frequently high turnover among restaurant staff, implying an almost continuous need to train new employees in recycling procedures.
- There is great and unavoidable potential for contamination either with inorganic materials like silverware and plastics, or cross-contamination of pre-plate and post-plate wastes in situations where source separation of pre- and post-consumer waste is required or preferred.
- Health regulations, as well as simple business considerations related to odors and aesthetics, limit the ability to store recovered organics for collection.
- Because most restaurants generate relatively small quantities of recyclable organics on a daily basis, and cannot store them, they are faced with high unit costs for collection and transportation.

Given this formidable set of barriers, it is easy to understand why restaurant organics recycling remains underdeveloped. What is clear is that if and when restaurant organics recycling succeeds, it will do so as a local initiative — first, because restaurants are so geographically clustered, and second, because the barriers to restaurant organics recycling are best addressed by education and collection programs that can be made efficient only at a local scale.

For this reason, this project did not attempt a statewide mapping of Connecticut restaurant properties or an analysis of SSOM generation, quantities or composition. Instead, it focused on identifying and mapping restaurants in a single county (Hartford County) to demonstrate the capabilities of the database and GIS mapping combination, and to point the way for similar mapping exercises that could be undertaken in other parts of the state.

6.1 Number and Type of Restaurants in Hartford County

Information on the population of restaurants in Hartford County was obtained from the Connecticut Economic Research Center. Table 6-1 summarizes the 1,614 restaurants identified.

The CERC data separates restaurants into 49 categories. Pizza restaurants are by far the most numerous single category, with 239 establishments, or nearly 15% of all Hartford County restaurants. They are followed by fast food and Chinese restaurants (110 and 109 establishments, respectively) and Italian restaurants (94 establishments).

Of restaurants that reported sales information, nearly 55% have sales of less than $200,000 per year, and another 26% have annual sales between $200,000 and $500,000. This distribution holds true across almost all restaurant categories. Extrapolated to the entire population of Hartford County restaurants, these values imply that over 850 of the 1,600 establishments have annual sales of less than $200,000, and nearly 1,300 have annual sales less than $500,000.

This distribution is also apparent when restaurants are sorted by number of employees (Table 6-2). Over 30% of all Hartford County restaurants have fewer than five employees, and over 50% have fewer than 10 employees.

Table 6-3 presents the number of chain restaurants (with at least five establishments) in Hartford County. Given their relatively uniform operations and management structure, it might be hoped that chains could be more easily organized to recycle than independent restaurants. Unfortunately, only about 12% of all Hartford County restaurants belong to chains. The true fast food chains such as McDonald's, Burger King, and Wendy's may also be relatively poor sources of SSOM for recycling, in that their style of service and management sophistication imply that they generate relatively little pre-consumer waste, while their post-plate waste stream is low in food scraps and heavily contaminated with packaging.

6.2 Geographic Distribution of Hartford County Restaurants

Map 5 graphically presents the distribution of restaurants in Hartford County. As one might expect, the distribution of restaurants generally follows the distribution of population in the county. There are no apparent patterns in restaurants' distribution by size, type, or other distinguishing characteristic. If anything, restaurants of similar types (including restaurants in any single chain) tend to be spaced evenly rather than clustered in any way.

Map 5 also demonstrates how the database/GIS information could be used to develop collection and hauling routes. Even a cursory scan of the GIS map allows a user to identify clusters of restaurant properties, and more detailed review allows them to be placed in relation to transportation arteries and assembled into possible collection routes. The underlying database information allows individual restaurants to be identified by type and size. Repeated queries to the database and mapping software could be used to refine the geographic search for potential recyclers, for example, by dropping out the smallest properties, focusing on restaurants of one or a few types, or requesting restaurants within a chosen collection/hauling radius. As noted in Section 5, latitude/longitude information from the generator database can be input directly into off-the-shelf route planning software to create a route plan to service any combination of generators in the SSOM generator database.

Table 6-1
Hartford County Restaurants by Type and Size (Sales)

SIC	Sales (Million $$)							Total	SIC Description
	<0.2	<0.5	<1.0	<2.5	<5.0	<10.0	Not Reported		
5812-0000	125	50	32	20	4	1	170	**402**	Eating places
5812-0100	8	1	0	1	0	0	5	**15**	Ethnic food restaurants
5812-0101	16	5	12	5	0	0	17	**55**	American restaurant
5812-0103	58	19	1	0	0	0	31	**109**	Chinese restaurant
5812-0106	4	1	0	0	0	0	0	**5**	Greek restaurant
5812-0107	5	1	1	0	0	0	2	**9**	Indian/Pakistan restaurant
5812-0108	17	27	16	9	0	0	25	**94**	Italian restaurant
5812-0109	5	2	0	0	0	0	3	**10**	Japanese restaurant
5812-0112	0	1	0	0	0	0	7	**8**	Mexican restaurant
5812-0113	3	1	0	0	0	0	0	**4**	Spanish restaurant
5812-0115	3	0	0	0	0	0	0	**3**	Thai restaurant
5812-0116	4	1	0	0	0	0	1	**6**	Vietnamese restaurant
5812-0200	1	1	0	0	0	0	1	**3**	Ice cream, soft drink and soda fountain stands
5812-0201	3	0	0	0	0	0	1	**4**	Concessionaire
5812-0202	1	0	0	0	0	0	0	**1**	Frozen yogurt stand
5812-0203	6	8	0	0	1	0	4	**19**	Ice cream stands or dairy bars
5812-0206	1	0	0	0	0	0	0	**1**	Soft drink stand
5812-0300	1	0	0	0	0	0	1	**2**	Fast food restaurants and stands
5812-0302	2	0	1	0	0	0	0	**3**	Carry-out only (except pizza) restaurant
5812-0304	9	4	3	1	0	0	10	**27**	Coffee shop
5812-0305	10	6	2	0	0	0	9	**27**	Delicatessen (eating places)
5812-0306	0	1	1	0	0	0	0	**2**	Drive-in restaurant
5812-0307	1	2	4	9	2	2	90	**110**	Fast-food restaurant, chain
5812-0308	2	0	1	1	0	0	2	**6**	Fast-food restaurant, independent
5812-0309	0	0	0	1	0	0	0	**1**	Food bars
5812-0310	3	3	1	0	0	0	1	**8**	Grills (eating places)
5812-0311	0	0	0	0	0	0	1	**1**	Hamburger stand
5812-0312	2	0	0	0	0	0	2	**4**	Hot dog stand
5812-0313	15	22	1	0	0	0	25	**63**	Sandwiches and submarines shop
5812-0314	2	2	0	0	0	0	2	**6**	Snack bar
5812-0400	3	1	0	0	0	0	1	**5**	Lunchrooms and cafeterias
5812-0402	5	1	2	0	0	1	8	**17**	Cafeteria
5812-0403	6	2	0	0	0	0	1	**9**	Luncheonette
5812-0405	0	1	1	0	0	0	0	**2**	Restaurant, lunch counter
5812-0500	1	5	5	1	1	0	11	**24**	Family restaurants
5812-0501	0	0	0	3	0	0	50	**53**	Restaurant, family: chain
5812-0502	10	10	5	2	1	0	7	**35**	Restaurant, family: independent
5812-0600	78	27	10	2	0	0	52	**169**	Pizza restaurants
5812-0601	1	5	1	1	0	0	14	**22**	Pizzeria, chain
5812-0602	27	11	3	3	0	0	4	**48**	Pizzeria, independent
5812-0700	5	4	3	1	0	0	2	**15**	Seafood restaurant
5812-0701	0	0	0	0	0	0	1	**1**	Oyster bar
5812-0801	0	0	1	0	1	0	1	**3**	Barbecue restaurant
5812-0802	4	1	1	2	0	0	7	**15**	Steak restaurant
5812-9901	2	1	0	0	0	0	8	**11**	Buffet (eating places)
5812-9902	30	9	2	2	0	0	28	**71**	Cafe
5812-9903	35	14	6	3	0	0	30	**88**	Caterers
5812-9906	0	0	0	0	0	0	4	**4**	Contract food services
5812-9907	4	7	0	1	0	0	1	**13**	Diner
5812-9909	1	0	0	0	0	0	0	**1**	Health food restaurant
Total	**519**	**257**	**116**	**68**	**10**	**4**	**640**	**1,614**	

Table 6-2

Hartford County Restaurants by Number of Employees

Number of Employees	1	2-4	5-9	10-24	25-49	50-99	100+
Reported Percent of Restaurants	6.1%	25.4%	18.8%	25.2%	14.1%	9.1%	1.4%
Estimated Number of Restaurants	98	410	303	407	228	147	23

Table 6-3

Chain Restaurants in Hartford County
(Five or More Properties)

Chain	Number	Percent of Hartford City Restaurants
McDonalds	46	2.9%
Friendlys	28	1.7%
Burger King	17	1.1%
D'Angelo Sandwich Shops	14	0.9%
Kentucky Fried Chicken	14	0.9%
Wendys	12	0.7%
Pizza Hut	10	0.6%
Blimpie	9	0.6%
Taco Bell	7	0.4%
Dominos Pizza	6	0.4%
Boson Market	5	0.3%
Chilis	5	0.3%
Congress Rotisserie	5	0.3%
Ground Round	5	0.3%
Peoples Choice Pizza	5	0.3%
Ruby Tuesday	5	0.3%
Subway	5	0.3%
Dunkin Donuts	4	0.2%
Total	**202**	**12.5%**

SECTION SEVEN

CONCLUSIONS

- From the set of 1,314 generators analyzed, this study identified a total of 98,946 to 153,331 tons/year of source separated organic materials (SSOM) potentially suitable for composting or other recycling. Additional tonnage, the quantity of which was not estimated in this study, is generated from a large number of businesses and institutions that are smaller than the size cutoffs established for this analysis.
- Based on the results of this study, enough SSOM is generated in Connecticut to support recycling efforts, either dedicated exclusively to SSOM, or for SSOM mixed and recycled with other organics (e.g., leaf and yard wastes).
- This study is the first of its kind to combine a database of source-separated organic matter generators, database information on the types and quantities of organic materials generated, and Geographic Information System (GIS) technology capable of graphically and flexibly representing this information.
- This combination of database information and GIS technology provides a flexible and powerful tool to identify and characterize SSOM in Connecticut that can be used by current or prospective SSOM recyclers, SSOM generators, haulers, and waste management planners.
- The database and GIS products of this analysis provide the State of Connecticut with an opportunity to create recycling markets for SSOM in Connecticut, and to create jobs and economic activity centered on this recycling opportunity.

APPENDIX A

CONNECTICUT SSOM GENERATOR DATABASE

This appendix is an electronic database containing 1,314 records and 44 fields of information. It lists all of the businesses and institutions analyzed in this study and gives pertinent data about them including address, size, generation of SSOM, latitude/longitude coordinates, contact person, etc. An example of the database data is provided in Table A-1.

Because if the large size of this file (300 printed pages/3.8 MB), and for the purposes of source reduction, the complete database is available only in electronic format. If you are reading this report on-line, or from CD, please follow the appropriate link to Appendix A. If you do not have access to the Internet, or do not have the capability to read CD's on your computer, please contact the CT DEP Recycling Program at 860-424-3365 to make other arrangements for viewing the database.

Table A-1
Sample of Database

Field Name	Example Data	
	Resort/Conference Facility	Supermarket
CatCode	C	G
Name	Ramada Plaza	A & P Super Foodmart
CTCode	I0039	G0018
SCode	CONF-39	SM-10
Address	780 Bridgeport Ave	P O Box 491
City	Shelton	Old Lyme
State	CT	CT
MailZip9	06484	06371-0491
Phone	203-929-1500	860-434-1433
ExecFull		
ExecTitle		Branch Manager
PhyAdd	780 Bridgeport Ave	90 Halls Rd
PhyCity	Shelton	Old Lyme
PhyState	CT	CT
PhyZip5	06484	06371
PhyPlus4		1454
Long	-73.122356	-72.32759
Lat	41.276719	41.32373
XCoord	897649	1116025
YCoord	661773	678964
Geostats	A	A
SIC4		5411
SIC4Name		Grocery stores

Table A-1 (continued) Sample of Database		
Field Name	**Example Data**	
	Resort/Conference Facility	**Supermarket**
SIC8		5411-0101
SIC8Name		Supermarkets, chain
SalesRange		unknown
SalesCode		U
EmpRange		100 to 249
EmplCode		F
LocType	HC	SC
Inmates_Students		
Day_Brd		
Beds	300	
Meals/Student		
Meals/Bed	0.25	
Meals/Day	75	
Waste/Meal	1	
PerMealUnits	lbs/meal	
WasteTypes	I	G
WasteQuantity		1.5
Units_WasteQuantity		tons/employee/yr
GenerationEstimate	13.69	225
Units_Generation	tons/yr	tons/yr
Disposition	T	U

APPENDIX B

SURVEY FORMS, COVER LETTERS AND PRESS RELEASE USED TO SOLICIT INFORMATION FROM CONNECTICUT SSOM GENERATORS

<Date>

«ExecPrefx» «ExecFirst» «ExecLast»
«BusName»
«Address»
«City», CT «ZIP4»

Dear «» «»:

The State of Connecticut is trying to help create more options for food manufacturers to recycle food manufacturing and processing wastes rather than throw them away. The first step is to find out how much food waste is generated in Connecticut, where it is coming from, and where it is going. Draper/Lennon is an environmental consulting firm based in New Hampshire, and the CT Department of Environmental Protection has retained us specifically to provide this layer of data collection and analysis. We hope you will take one or two minutes (literally, no more than that) to help us with this project.

On the attached page are a few very brief questions about the types and management of food wastes generated at «». If you can please take a moment to answer these to the best of your ability, or refer them to the manager who would have the best information, the State will be that much further along in its ability to help companies like «» find ways to reduce waste and save disposal fees by recycling instead of disposing of leftover organics.

I'd like to emphasize that any information you provide will be treated strictly as Confidential Business Information and will not be divulged to the state or any other party, or used for any purpose other than to develop summary estimates of statewide organics generation. I have attached a copy of a press release about the project for your information.

Thank you in advance for your help. Please do not hesitate to call me if you have any questions, or to call Connecticut DEP's project manager, Kathy (K.C.) Alexander at 860-424-3239.

Yours,

Mark Lennon
Project Manager

FAX TO: MARK LENNON
FAX NUMBER: 603-229-1960

FROM: «»
«»

1. What type of food waste or other organic wastes are generated at this facility? (please list all)
   _____
   _____

2. Approximately how much food waste is generated at this facility?
   _____ (lbs/week, tons/month, tons/yr, etc.)

   If weights are not available, how many containers do you fill/day and what is the size of the container?
   _____ containers/day _____ size of container

3. How are food wastes currently disposed from your facility?
   ____ put in the trash _____ sent to a pig farm ____ sent to a compost facility
   _____ sent to an animal feed manufacturer _____ other (describe)

4. Whom may I contact with questions about food waste generation and disposal from your facility?
   _____ name _____ title (____)_____ phone

PLEASE RETURN BY FAX BY <DATE> TO 603-229-1960

State of Connecticut
Department of
Environmental Protection

FOR MORE INFORMATION: K.C. Alexander, CT DEP (860) 424-3365
Mark Lennon, Draper/Lennon, Inc. (603) 229-1600

November 22, 2000

FOR IMMEDIATE RELEASE

New Project to Promote Recycling of Food Scraps in Connecticut

The Connecticut Department of Environmental Protection (DEP) has launched a new project to promote recycling of food scraps in Connecticut. The goal of the new project is to identify, quantify, and map all the commercial and institutional locations in Connecticut where potentially recyclable food scraps are generated, and then to match these against the state's transportation network and current composting infrastructure. The project is one of the first to use Geographic Information System (GIS) technology to help promote recycling. Called 'density mapping', the project will visually illustrate all areas in the state where there are concentrations of generators producing similar types of food scraps. By matching these against transportation routes, an entrepreneur, composter or hauler can not only see where food generators are located, but can use the information to help line-up new accounts, select the right collection vehicles, design efficient transportation routes, and choose logical locations to site new organics recycling facilities

"We'll use GIS to graphically show the location, quantity, and types of food scraps generated throughout the state," said DEP Commissioner Arthur J. Rocque, Jr.

The DEP is working with consultant Draper/Lennon, Inc. of Concord, NH; GIS specialist Atlantic Geoscience Corp. of Laconia, NH; and the CT Economic Resource Center. To date, they have identified over 2000 food scrap generators in Connecticut. These businesses are comprised of food processors like bakeries, meat packers, dairies, ice cream manufacturers, pasta factories, and potato chip plants. Also included are supermarkets, casinos, military installations, produce terminals, and the cafeterias in colleges, hospitals, prisons, and most of Connecticut's large employers.

"We hope to find just about everyone with significant quantities of recyclable food scraps. Almost all of these businesses produce food scraps that could be easily and economically recycled, if we can help set up a good transportation and recycling network" according to K.C. Alexander, the DEP's organics recycling specialist.

"A project like this serves many goals," says Commissioner Rocque. "It will address one of our most critical waste management needs. It can help our food industry, a large and vital part of our economy, to save money in disposal fees, and it will help generate new economic development in organics recycling. It's demonstrating a new application for GIS that will help our recycling and waste management programs. And most important, it will help get a valuable resource out of our waste stream, and back into the economy where it belongs."

Organic materials are one of the largest parts of the United States solid waste stream, with food scraps accounting for over 10 percent of all wastes generated by U.S. households and businesses. Historically, food scraps have also been one of the most troublesome to recycle due to the lack of sufficient infrastructure and processing facilities. At the same time, however, many organic materials have significant value as a feedstock in compost or as an ingredient in the production of animal feeds and fertilizers. Recognizing this potential, Connecticut's Proposed Solid Waste Management Plan has identified food scrap recycling as one of the state's most critical strategies to reach its source reduction and recycling objectives in the coming decade and to avoid the need for expanded waste incineration.

The project is slated to be complete in March 2001.

# # # # #

APPENDIX C

SURVEY RESPONSE INFORMATION FROM FOOD MANUFACTURERS/PROCESSORS

Table C-1 Summary of Waste Generation and Management Practices: Meat Packing and Processing	
SIC Codes	2011: Meat Packing Plants 2013: Sausages and Meat Products 2015: Poultry Slaughtering, Dressing, Processing 2091: Canned and cured fish and seafood 2092: Fresh or frozen packaged fish
N in Database	46
N Responding to Survey and Followup	23
N Reporting Zero Waste	8
Reasons for Zero Waste	Distributor only 4 Purchase deboned or pre-processed materials 3 Unknown 2
N Reporting Waste Tonnage	15
Tonnage Reported (lbs/week)	Range: 10 - 5,000 Mean: 1,200 Median: 325
Waste Types Reported	Meat scraps, inedible meat portions Fish and shellfish meat, bones, cartilage Bones Fat Bakery products Vegetable products
Relationship to Sales	No
Relationship to Employees	No
Disposition	Trash 8 Renderer 10 Animal Feed 1 Soup Kitchen 1 Unknown 1

Table C-2 Summary of Waste Generation and Management Practices: Dairy Products	
SIC Codes	2022: Cheese, natural and processed 2023: Dry, condensed and evaporated dairy products 2024: Ice cream and frozen desserts 2026: Fluid milk
N in Database	44
N Responding to Survey and Followup	12
N Reporting Zero Waste	6
Reasons for Zero Waste	Distributor only 6
N Reporting Waste Tonnage	6
Tonnage Reported (lbs/week)	Range: "Very little" - 29,000 Mean: 3,400 Median: Not Applicable
Waste Types Reported	Ice cream mixes, ice cream waste Spoiled product Yogurt and toppings
Relationship to Sales	No
Relationship to Employees	No
Disposition	Trash 3 Sewer 3 Pig farm 1 Compost 1

Table C-3 Summary of Waste Generation and Management Practices: Fruits and Vegetables	
SIC Codes	2032: Canned specialties 2033: Canned fruits, vegetables, & preserves 2034: Dried fruits, vegetables & soup 2035: Pickles, sauces, and salad dressings 2037: Frozen fruits, fruit juices, and vegetables 2038: Frozen specialties
N in Database	22
N Responding to Survey and Followup	11
N Reporting Zero Waste	6
Reasons for Zero Waste	Distributor only 2 Research and development 1 No reason given 4
N Reporting Waste Tonnage	5
Tonnage Reported (lbs/week)	Range: 750 - 150,000 Mean: 23,000 Median: 1,000
Waste Types Reported	Tomato products Pasta products Animal fat and grease Cheese Filter cake Cabbages, potatoes
Relationship to Sales	No
Relationship to Employees	No
Disposition	Trash 4 Compost 1 Animal feed (direct) 1

Table C-4 Summary of Waste Generation and Management Practices: Flour and Feed Products	
SIC Codes	2041: Flour and other grain mill products 2045: Prepared flour mixes and doughs 2047: Dog and cat food 2048: Prepared feeds, other
N in Database	12
N Responding to Survey and Followup	4
N Reporting Zero Waste	1
Reasons for Zero Waste	Distributor only
N Reporting Waste Tonnage	3
Tonnage Reported (lbs/week)	Range: "Very little" - 3,000 Mean: 1,030 Median: 100
Waste Types Reported	Egg shells Grain products Vitamins and minerals
Relationship to Sales	No
Relationship to Employees	No
Disposition	Trash 2 Animal feed 1

Table C-5 Summary of Waste Generation and Management Practices: Bakeries and Related Products	
SIC Codes	2051: Bread, cake, and related products 2052: Cookies and crackers 2053: Frozen bakery products 2096: Potato chips and similar snacks 2098: Macaroni, spaghetti & noodles
N in Database	106
N Responding to Survey and Followup	29
N Reporting Zero Waste	7
Reasons for Zero Waste	Distributor only 6 Unknown 1
N Reporting Waste Tonnage	22
Tonnage Reported (lbs/week)	Range: 10 - 144,000 Mean: 25,000 Median: 750
Waste Types Reported	"Cripple" (off-spec, end-of-run, etc.) bakery products Day-old and stale bakery products Pie dough Tortilla chips Potato chips, corn chips, other snack foods Cooked and raw pasta with meat and cheese Fruits and vegetables
Relationship to Sales	Yes
Relationship to Employees	Yes
Disposition	Trash 10 Animal feed 5 Soup kitchen 1 Sold as stale 1 Bread crumbs 1 Compost 1 Pig farm 1 Unknown 2

Table C-6 Summary of Waste Generation and Management Practices: Chocolate and Candy	
SIC Codes	2064: Candy and other confectionery products 2066: Chocolate and cocoa products 2068: Salted and roasted nuts & seeds
N in Database	20
N Responding to Survey and Followup	8
N Reporting Zero Waste	3
Reasons for Zero Waste	Distributor only 1 Unknown 2
N Reporting Waste Tonnage	5
Tonnage Reported (lbs/week)	Range: 200 - 7,000 Mean: 3,100 Median: 875
Waste Types Reported	Filter cake Scrap candy Sugar waste Chocolate scraps Nuts, raisins, cherries, cookie bits
Relationship to Sales	No
Relationship to Employees	No
Disposition	Trash 1 Animal feed 2 Pig farm 1 Ice cream manufacturer 1

Table C-7 Summary of Waste Generation and Management Practices: Beverage Manufacturers	
SIC Codes	2082: Malt beverages 2084: Wines, brandy, and brandy spirits 2086: Bottled and canned soft drinks 2087: Flavoring extracts and syrups
N in Database	24
N Responding to Survey and Followup	5
N Reporting Zero Waste	1
Reasons for Zero Waste	Manufactures witch hazel
N Reporting Waste Tonnage	4
Tonnage Reported (lbs/week)	Range: "Very little" - 2,500 Mean: 700 Median: 150
Waste Types Reported	Spent brewers grains Grape skins and seeds Concentrated flavors
Relationship to Sales	No
Relationship to Employees	No
Disposition	Trash 1 Dairy farm 1 Compost 2

APPENDIX D

SURVEY RESPONSE INFORMATION FROM FOOD DISTRIBUTORS/WHOLESALERS

Table D-1 Summary of Waste Generation and Management Practices: Wholesalers, General Line Groceries	
SIC Codes	5141: Groceries, general line
N in Database	19
N Responding to Survey and Followup	8
N Reporting Zero Waste	5
Reasons for Zero Waste	Distributor only 5
N Reporting Waste Tonnage	3
Tonnage Reported (lbs/week)	Range: Unknown (2) - 300 Mean: Not applicable Median: Not applicable
Waste Types Reported	Fresh and spoiled produce Beef fat, bones, damaged dry goods, bakery supplies, canned goods
Relationship to Sales	No
Relationship to Employees	No
Disposition	Trash 4 Animal feed 1 Pig farm 1

Table D-2 Summary of Waste Generation and Management Practices: Wholesalers, Dairy Products	
SIC Codes	5143: Dairy products, except dried or canned
N in Database	12
N Responding to Survey and Followup	3
N Reporting Zero Waste	3
Reasons for Zero Waste	Distributor or importer only 3
N Reporting Waste Tonnage	0
Tonnage Reported (lbs/week)	Range: Not Applicable Mean: Not Applicable Median: Not Applicable
Waste Types Reported	Not Applicable
Relationship to Sales	Not Applicable
Relationship to Employees	Not Applicable
Disposition	Not Applicable

Table D-3 Summary of Waste Generation and Management Practices: Wholesalers, Meat, Fish, Poultry	
SIC Codes	5144: Poultry and poultry products 5146: Fish and seafood 5147: Meats and meat products
N in Database	38
N Responding to Survey and Followup	17
N Reporting Zero Waste	6
Reasons for Zero Waste	Distributor or broker only 6
N Reporting Waste Tonnage	11
Tonnage Reported (lbs/week)	Range: 25 - 3,000 Mean: 960 Median: 650
Waste Types Reported	Fish, lobster, seafood scraps Poultry, eggs Meat scraps and hides
Relationship to Sales	No
Relationship to Employees	No
Disposition	Trash 5 Renderer 5 Compost 1 Animal feed 1 Lobstermen 1

Table D-4 Summary of Waste Generation and Management Practices: Wholesalers, Fresh Fruits and Vegetables	
SIC Codes	5148: Fresh fruits and vegetables
N in Database	23
N Responding to Survey and Followup	7
N Reporting Zero Waste	0
Reasons for Zero Waste	Not Applicable
N Reporting Waste Tonnage	7
Tonnage Reported (lbs/week)	Range: 75 - 1,000 (1 unknown) Mean: 360 Median: 250
Waste Types Reported	Fruits and vegetables Baked goods
Relationship to Sales	No
Relationship to Employees	No
Disposition	Trash 3 Grind/sewer 1 Animal feed (on-site) 1 Pig farm 1 Donation 4

Table D-5 Summary of Waste Generation and Management Practices: Wholesalers, Miscellaneous	
SIC Codes	5149: Groceries and related products, not elsewhere classified 5153: Grain and field beans
N in Database	61
N Responding to Survey and Followup	19
N Reporting Zero Waste	9
Reasons for Zero Waste	Distributor, importer, broker only 8 Unknown 1
N Reporting Waste Tonnage	10
Tonnage Reported (lbs/week)	Range: 20 - 4,000 Mean: 850 Median: 100
Waste Types Reported	Finished and stale baked goods Egg shells
Relationship to Sales	No
Relationship to Employees	No
Disposition	Trash 8 Donate 4 Pig farm 3 Bread crumbs, other re-use 2

APPENDIX E

SSOM GENERATOR DATABASE FIELD NAMES AND GIS METADATA

SSOM GENERATOR DATABASE FIELD NAMES AND GIS METADATA

The GIS shapefiles listed below contain the commercial and institutional generators of Source Separated Organic Materials in Connecticut at the time of publication (December 2000). The generators are categorized as: Food and Beverage Manufacturers and Processors, Food Wholesalers and Distributors, Institutions (Healthcare Facilities, Colleges/Universities, Independent Schools and Prisons), Supermarkets, Resorts/Conference Facilities and Restaurants. The associated data tables were compiled from existing inventories of the food waste generators. Where the locations of the facilities were not included with the original company data, the facility coordinates were obtained by matching the street addresses with geo-coded street maps. The accuracy of the points is dependent on the accuracy of the particular geo-coded roads and the proximity of the actual building to the street address. The street address data were obtained by various sources. Codes for the geo-referencing methods were included in the attribute data field named 'Geostats'. Use of these datalayers is intended for general state or town based assessments only, since the spatial accuracy may be less than is necessary for large-scale mapping. Generators in the shapefiles based on facility type are duplicated in the shapefiles based on waste type. Some generators are contained in multiple waste type shapefiles.

Generator Points

Data Type: Feature
Feature Type: Point
Data Format: Shapefile

SSOM Theme Files

Theme Name	Data Source	Legends
Food Manufacturers	…\data\dep\ssom\shapes\food.shp	…\data\dep\ssom\shapes\food.avl
Beverage Manufacturers	…\data\dep\ssom\shapes\beverage.shp	…\data\dep\ssom\shapes\beverage.avl
Wholesale Distributors	…\data\dep\ssom\shapes\wholesalers.shp	…\data\dep\ssom\shapes\wholesalers.avl
Institutions	…\data\dep\ssom\shapes\institutions.shp	…\data\dep\ssom\shapes\institutions.avl …\data\dep\ssom\shapes\institutewaste.avl
Colleges and Universities	…\data\dep\ssom\shapes\colleges.shp	…\data\dep\ssom\shapes\colleges.avl
Independent Preparatory School	…\data\dep\ssom\shapes\prepschools.shp	…\data\dep\ssom\shapes\prepschools.avl
Prisons / Correctional Facilities	…\data\dep\ssom\shapes\prisons.shp	…\data\dep\ssom\shapes\prisons.avl
Healthcare Facilities	…\data\dep\ssom\shapes\healthcare.shp	…\data\dep\ssom\shapes\healthcare.shp
Supermarkets	…\data\dep\ssom\shapes\supermarkets.shp	…\data\dep\ssom\shapes\supermarkets.avl …\data\dep\ssom\shapes\supermwaste.avl
Resorts and Conference Centers	…\data\dep\ssom\shapes\resorts.shp	…\data\dep\ssom\shapes\resorts.avl …\data\dep\ssom\shapes\resortwaste.avl
Restaurants	…\data\dep\ssom\shapes\restaurants.shp	…\data\dep\ssom\shapes\restaurants.avl
All Generators	…\data\dep\ssom\shapes\allgenerators.shp	…\data\dep\ssom\shapes\allgenerators.avl
Compost Sites	…\data\dep\ssom\shapes\compostsites.shp	…\data\dep\ssom\shapes\compostsites.avl
Recyclers	…\data\dep\ssom\shapes\recyclers.shp	…\data\dep\ssom\shapes\recyclers.avl
Meat Waste	…\data\dep\ssom\shapes\meatwaste.shp	…\data\dep\ssom\shapes\meatwaste.avl
Fish Waste	…\data\dep\ssom\shapes\fishwaste.shp	…\data\dep\ssom\shapes\fishwaste.avl
Vegetable Waste	…\data\dep\ssom\shapes\vegwaste.shp	…\data\dep\ssom\shapes\vegwaste.avl
Beer and Wine Waste	…\data\dep\ssom\shapes\bwwaste.shp	…\data\dep\ssom\shapes\bwwaste.avl
Dairy Waste	…\data\dep\ssom\shapes\dairywaste.shp	…\data\dep\ssom\shapes\dairywaste.avl
Sugar and Starch Waste	…\data\dep\ssom\shapes\sugstrchwaste.shp	…\data\dep\ssom\shapes\sugstrchwaste.avl
Bakery Waste	…\data\dep\ssom\shapes\bakerywaste.shp	…\data\dep\ssom\shapes\bakerywaste.avl
Pasta Waste	…\data\dep\ssom\shapes\pastawaste.shp	…\data\dep\ssom\shapes\pastawaste.avl
Snack Food Waste	…\data\dep\ssom\shapes\snackwaste.shp	…\data\dep\ssom\shapes\snackwaste.avl
Other Waste	…\data\dep\ssom\shapes\otherwaste.shp	…\data\dep\ssom\shapes\otherwaste.avl

Theme Attribute Table

Field	Name	Description	Type	Units	Domain
CatCode	Category Code	Single Letter Identifier of Generator Type	String		Codes
CTCode	Manufacturer Code	Unique Identifier of CT SSOM Generator	String		
SCode	Source Code	Source of Generator Data	String		
Name	Business Name	Business Name	String		
Address	Mailing Address	Mailing Address	String		
City	Mailing City	Mailing City	String		
State	Mailing State	Mailing State	String		
MailZip9	Mailing Zip Code	Mailing Zip Code	String		
Phone	Phone Number	Phone Number	String		
ExecFull	Executive Full Name	Full Name of Business Executive	String		
Exec Title	Executive Title	Executive Title	String		
PhyAdd	Physical Address	Physical Address of Business	String		
PhyCity	Physical City	Physical City of Business Location	String		
PhyState	Physical State	Physical State of Business Location	String		
PhyZip5	Physical Zip Code (5)	5 Digit Zip Code of Business Location	Number		
PhyPlus4	Physical Zip Plus 4	Plus 4 Zip Code of Business Location	Number		
Long	Longitude	Longitude Coordinate of Business	Number	Decimal Degrees	
Lat	Latitude	Latitude Coordinate of Business	Number	Decimal Degrees	
XCoord	X Coordinate	X Coordinate (State Plane - NAD83)	Number	Feet	
YCoord	Y Coordinate	Y Coordinate (State Plane - NAD83)	Number	Feet	
Geostats	Geo-referencing Status	Code to identify the process used to obtain the geographic coordinates	String		Codes
SIC4	SIC 4 Digit Code	Standard Industrial Classification	Number		
SIC4Name	SIC 4 Name	Standard Industrial Classification Description	String		
SIC8	SIC 8 Digit Code	Standard Industrial Classification	String		
SIC8Name	SIC 8 Digit Code	Standard Industrial Classification Description	String		
SalesRange	Sales Range	Range of Sales Generated	String		
SalesCode	Sales Code	Sales Range by Code	String		Codes
EmpRange	Number of Employees	Range of Number of Employees	String		
EmplCode	Employee # Code	Coded Number of Employees			Codes
LocType	Location Type	Type of Location (single	String		

		location, headquarters, branch plant, etc…)			
Inmates_Students	Number of Inmates or Students	Inmates for Prison category Students for Colleges and Independent Schools categories	Number		
Day_Brd	Day(D) or Boarding(B)	Type of facility services - day or boarding	String		D or B
Beds	Number of Beds	Number of beds in Healthcare Facilities and Resorts/ConfCtrs	Number		
Meals/Student	Number of Meals per Student	Number of meals per student in College/University category	Number		
Meals/Bed	Number of Meals per Bed	Number of meals per bed in Healthcare and Resorts	Number		
Meal/Day	Number of Meals per Day	Number of meals per day in College/University, Healthcare and Resort/ConfCtr Facilities	Number		
Waste/Meal	Amount of Waste per Meal	Weight of waste generated per meal	Number		
PerMealUnits	Units of Waste per Meal	Units of Waste per Meal	String		
WasteTypes	Food Waste Type	Type of Food Waste	String		Codes
WasteQuantity	Food Waste Quantity	Food Waste Quantity	Number		
Units_WasteQuantity	Units	Units of Waste Quantity	String		
GenerationEstimate	Waste Generation Estimate	Estimate of annual food waste generation. Based on WasteQuantity calculations	Number		
Units_Generation	Units	Units of Waste Generation Estimate. Typically tons/yr.	String		
Disposition	Disposition	How Food Waste is Disposed	String		Codes

Horizontal Coordinate System

Coordinate System	State Plane Coordinate System of 1983
State Plane Zone	Connecticut, Zone 3526
Horizontal Datum	North American Datum of 1983 (NAD 83)
Map Projection	Lambert Conformal Conic
Spheriod	GRS 80
Map Scale	
Map Units	Feet

Point of Contact

Contact Person	Jonathan Scull
Organization	State of Connecticut Department of Environmental Protection Environmental and Geographic Information Center
Mailing Address	79 Elm Street Hartford, CT 06106-5127
Phone	(860) 424-3597
Fax	(860) 424-4058
Email	Jonathan.scull@po.state.ct.us

Facility Category Codes

CatCode	Category Description
F	Food Manufacturers
B	Beverage Manufacturers
W	Wholesale Distributors
I	Institutions (Healthcare Facilities, Independent Schools, Colleges/Universities, Prisons) (CTCode: H, S, C, P)
C	Resorts and Conference Facilities
G	Supermarkets and Grocery Stores
R	Restaurants

Geo-referencing Status Code

Geostats	Description
A	Location obtained by address matching the street addresses with geo-coded street maps. Service provided by GDT, Inc.
O	Location obtained by the original generator data provider. Original coordinates used if address information was not complete or if GDT did not provide matched data. Exception with wholesale and supermarket data - most original location used since close comparison was determined with GDT results (8 to 140 ft)
T	Location obtained by geocoding with TIGER street data and refined addresses (yellow pages address searches). Facility locations confirmed with USGS topographical maps where possible. This was especially effective with schools and hospitals.
S	Location estimated with street information, either by street and address number where number was not a street data option; or by street where street was relatively short and topographic information supported location.
2	Location provided as the centroid of the 5+2 digit Zip Code (2)
X	Location provided as the centroid of the 5 digit Zip Code (5)

Sales Codes

A	<$499K
B	$500K - $999K
C	$1.0M - $2.49M
D	$2.5M - $4.9M
E	$5.0M - $9.9M
F	$10.0M - $24.9M
G	$25.0M - $49.9M
H	$50.0M - $99.9M
I	$100.0M - $499.9M
J	>500.0M
U	Unknown

Employment Codes

Code	Number of Employees
A	0-4
B	5-9
C	10-24
D	25-49
E	50-99
F	100-249
G	250-499
H	500-999
I	1000-2499
U	Unknown

Waste Type Code

Waste Type Code	Description
M	Meat
F	Fish
V	Vegetable
S	Sugar, starch, confectionery, chocolate
A	Grains from beer, skins/pulp from vineyards
D	Dairy
B	Bakery
P	Pasta
J	Snack food
I	Institutional kitchen (schools, healthcare facilities, prisons, resort/conference facilities)
G	Supermarket, grocery store
X	Other

Disposition Code

Disposition Code	Description
R	Recycle Organic Waste (i.e., compost, pig farm, etc…)
T	Trash
U	Unknown