

# **Identification, Characterization, and Mapping of Food Waste and Food Waste Generators In Massachusetts**

## ***FINAL REPORT***

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## **Table of Contents**

| <u>Section</u>                                                     | <u>Page</u> |
|--------------------------------------------------------------------|-------------|
| Executive Summary                                                  | 1           |
| Introduction                                                       | 3           |
| Number And Nature of Food Waste Generators in Massachusetts        | 4           |
| Food Waste Generation Rates by Generator Category                  | 5           |
| Food Waste Composition                                             | 6           |
| Statewide Food Waste Generation Estimates                          | 7           |
| Food Waste Database and Geographic Information System Capabilities | 10          |
| Database Update Plan                                               | 11          |
| Conclusions                                                        | 13          |

## References

## Appendices

- A Detailed Information on Massachusetts Manufacturer/Processor, Wholesaler/Distributor, and Restaurant Food Waste Generator Categories
- B Detailed Description of GIS Mapping Capabilities and Protocols
- C Food Waste Generator Database Field Names and GIS Metadata

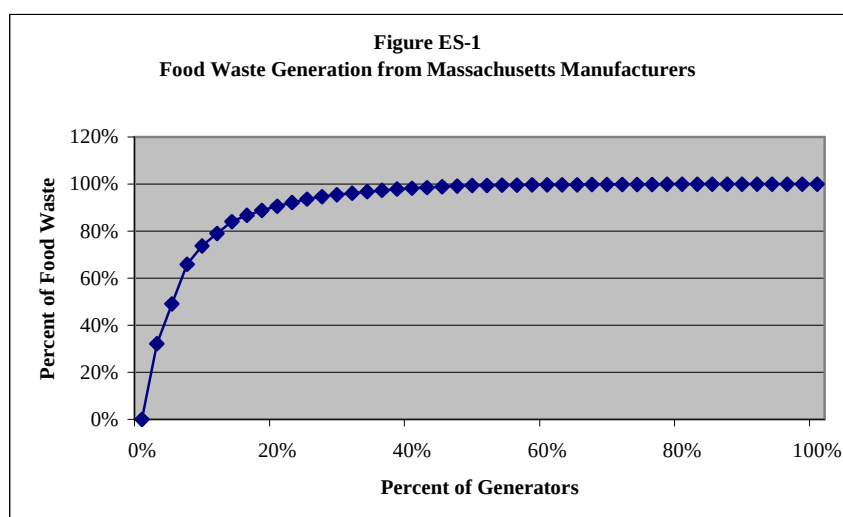
## EXECUTIVE SUMMARY

This study was undertaken with three goals:

1. To produce a comprehensive database of food waste generators in Massachusetts in the following generator categories:
  - Manufacturers/Processors
  - Distributors/Wholesalers
  - Hospitals
  - Nursing Homes (and related facilities)
  - Colleges and Universities
  - Independent Preparatory Schools
  - Correctional Facilities
  - Resorts/Conference Facilities
  - Supermarkets
  - Restaurants
2. To produce an estimate of statewide generation of food wastes from identified generators in these categories.
3. To provide a set of Geographic Information System (GIS) tools that will allow the state to use GIS technology to map food waste generators by category, size, waste types, waste quantities, and other variables, in order to facilitate development of composting or organics diversion infrastructure on a statewide or local basis.

Omitting very small establishments in some generator categories, the study identified a total of 5,799 food waste generators in Massachusetts, producing an estimated 880,000 tons per year of food waste (Table ES-1). The state's food manufacturing industry is the source of approximately 56% of this total, or nearly 500,000 tons/year, although this figure is dominated by the large contribution from a relatively small number of major generators (Figure ES-1). Clearly there are many attractive targets for composting or organics diversion in this sector, although a significant proportion of the major generators have already implemented some form of recycling program. Supermarkets are another major generating sector that is a favorable target for composting or organics diversion, because of their relatively homogeneous waste stream, and because of the fact that the majority of wastes from this sector come from fewer than a dozen major supermarket chains. The database also clearly identifies restaurants as a third major food waste generating sector, although composting or organics diversion initiatives among restaurants are made complicated by their relatively small individual size, and by concerns related to logistics, sanitation, and contamination.

| <b>Table ES-1</b><br><b>Summary of Massachusetts Food Waste Generation from Generators Analyzed in Study</b> |                          |                                 |                                             |
|--------------------------------------------------------------------------------------------------------------|--------------------------|---------------------------------|---------------------------------------------|
| Generator Category                                                                                           | Number of Establishments | Total SSOM Generation (tons/yr) | SSOM Generation Per Establishment (tons/yr) |
| Manufacturers / Processors                                                                                   | 727                      | 493,698                         | 656                                         |
| Wholesalers / Distributors                                                                                   | 304                      | 44,688                          | 147                                         |
| Hospitals                                                                                                    | 126                      | 14,538                          | 117                                         |
| Nursing Homes and Related                                                                                    | 507                      | 27,409                          | 54                                          |
| Colleges, Universities                                                                                       | 101                      | 24,458                          | 242                                         |
| Independent Preparatory Schools                                                                              | 20                       | 955                             | 50                                          |
| Correctional Institutions                                                                                    | 17                       | 1,762                           | 104                                         |
| Resorts / Conference Facilities                                                                              | 105                      | 6,442                           | 61                                          |
| Supermarkets                                                                                                 |                          |                                 |                                             |
| Supermarkets (SIC 5411-0100, 0101, 0103, 9901)                                                               | 408                      | 90,604                          | 222                                         |
| Grocery Stores (SIC 5411-0000, 9902, 9904, 9905)                                                             | 164                      | 7,022                           | 43                                          |
| Restaurants                                                                                                  | 3,320                    | 168,191                         | 51                                          |
| <b>TOTAL</b>                                                                                                 | <b>5,799</b>             | <b>879,767</b>                  | <b>---</b>                                  |



From the perspective of establishing food waste composting or other diversion initiatives in Massachusetts, the GIS mapping capabilities provided by this study are a valuable tool. Linked to a GIS

system (ArcView version 3.2a), the database can graphically display food waste generators by generator type, waste type, waste generation estimates, and a variety of other attributes. With the GIS system, generators can be portrayed on base maps that contain features such as local roads and streets, major statewide traffic arteries, and town boundaries. Users of the database/GIS system can view generator locations at scales ranging from generalized statewide maps to large scale maps that pinpoint generator locations on individual streets. Users can also obtain generator-specific information on any mapped generator, and can create customized hard copy and on-screen maps to display generator locations with symbols selected and scaled to show any desired generator attribute data (generator type, waste type, size, waste generation, etc.). Database query capabilities can also be combined with the GIS technology to pose and answer sophisticated questions about food waste generation in Massachusetts at a statewide or local scale – for example, to identify all supermarkets within a specified transportation radius of a composting facility, to identify all generators of a specific waste type on a statewide, regional, or local basis, or to identify restaurants in a specific locality that might be targeted for a local composting program.

## **INTRODUCTION**

This project was implemented to improve the climate for recovering and composting Source-Separated Organic Materials (SSOM) in Massachusetts. Source Separated Organic Materials are 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 by-products, is a major obstacle to the development of SSOM composting or organics diversion capabilities. This project has sought to address this obstacle in three ways:

1. To identify, in as much detail as possible, all of the major food waste generators in Massachusetts, including food manufacturers, processors, and distributors, colleges and universities, hospitals and other healthcare institutions, resort/conference facilities, correctional facilities, restaurants, 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 composting or organics diversion, and facilitate the development of an efficient collection infrastructure.

The products of the project are this report; a food waste generator database of Massachusetts businesses and institutions geographically encoded for each generator; food waste generation formulas for specific generator categories; and three sample maps for data illustrative purposes. The enhanced or geo-coded organic waste databases combined with Massachusetts DEP’s 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 Massachusetts. 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 composting or organics diversion

facilities. Lack of information, not technology or economics, has been the most significant obstacle to successful organics composting or organics diversion in Massachusetts. 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 obstacle.

## NUMBER AND NATURE OF FOOD WASTE GENERATORS IN MASSACHUSETTS

Ten categories of SSOM generators were analyzed in this study. They are summarized in Table 1.

| <b>Table 1</b><br><b>Summary of Massachusetts Food Waste Generators Analyzed In This Study</b> |               |                                                                                                              |
|------------------------------------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------------------------------|
| <b>Generator Category</b>                                                                      | <b>Number</b> | <b>Minimum Size Included in Database</b>                                                                     |
| Food manufacturers / processors                                                                | 727           | >=5 employees                                                                                                |
| Food wholesalers / distributors                                                                | 304           | >=5 employees                                                                                                |
| Hospitals                                                                                      | 126           | All identified inpatient establishments included                                                             |
| Nursing homes                                                                                  | 507           | All identified establishments included                                                                       |
| Colleges, universities                                                                         | 101           | All identified establishments included                                                                       |
| Independent schools, primary and/or secondary                                                  | 20            | Boarding schools only, >250 students                                                                         |
| Correctional facilities                                                                        | 17            | All identified establishments included (state corrections system only, not including county and local jails) |
| Resorts / conference properties                                                                | 105           | Banquet seating for >=250 guests                                                                             |
| Restaurants                                                                                    | 3,320         | >=10 employees and >=\$200,000 annual sales                                                                  |
| Supermarkets, grocery stores                                                                   | 572           | >\$1.5 million sales, or >15 employees (convenience stores excluded)                                         |
| <b>TOTAL</b>                                                                                   | <b>5,799</b>  |                                                                                                              |

For six generator categories, a size cutoff was established which reduced the number of establishments included in the generator database (see Table 1). Based on a review of information from Massachusetts and elsewhere, it was determined that although there may be a relatively large number of smaller generators, individually and collectively they do not contribute a substantial proportion to statewide food waste generation. And although on-site composting may be an option for some number of these smaller generators, they are generally not attractive candidates for source separation and composting or organics diversion through a network of haulers and off-site processing facilities. It was decided that to include these smaller generators in the generator databases and maps would add unnecessary clutter to the results of this analysis, without adding to their accuracy or utility.

The tables in Appendix A provide additional details on Massachusetts food waste generators in the manufacturer/processor category (Table A-1), the wholesaler/distributor category (Table A-2), and the restaurant category (Table A-3).

## FOOD WASTE GENERATION RATES BY GENERATOR CATEGORY

One goal of this project is to develop quantitative estimates of organic waste generation 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 Massachusetts SSOM generators, this has proven possible for eight of the ten generator categories, including:

- Hospitals
- Nursing homes
- Colleges and universities
- Independent preparatory schools
- Correctional facilities
- Resort and conference facilities
- Restaurants
- Supermarkets

Table 2 summarizes the relationships established for each of these generator categories.

| <b>Table 2</b><br><b>Food Waste Generation Estimates by Generator Category<sup>1</sup></b>                                                                                                                                                                                                                                                                                    |                                                                                                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| <b>Hospitals</b>                                                                                                                                                                                                                                                                                                                                                              | Food waste (lbs/yr) = N of beds * 5.7 meals/bed/day * 0.6 lbs food waste/meal * 365 days/yr      |
| <b>Nursing Homes and Similar Facilities</b>                                                                                                                                                                                                                                                                                                                                   | Food waste (lbs/yr) = N of beds * 3.0 meals/bed/day * 0.6 lbs food waste/meal * 365 days/yr      |
| <b>Colleges, Universities, and Independent Preparatory Schools</b><br><b>Residential Institutions</b><br>Food waste (lbs/yr) = 0.35 lbs/meal * N of students * 405 meals/student/yr<br><b>Non-Residential Institutions (e.g., community colleges)</b><br>Food waste (lbs/yr) = 0.35 lbs/meal * N of students * 108 meals/student/yr                                           |                                                                                                  |
| <b>Correctional Facilities</b>                                                                                                                                                                                                                                                                                                                                                | Food waste (lbs/yr) = 1.0 lb/inmate/day * N of inmates * 365 days/yr                             |
| <b>Resorts / Conference Properties</b>                                                                                                                                                                                                                                                                                                                                        | Food waste (lbs/yr) = 1.0 lbs/meal * N of meals/seat/day <sup>2</sup> * N of seats * 365 days/yr |
| <b>Supermarkets</b>                                                                                                                                                                                                                                                                                                                                                           | Food waste (lbs/year) = N of employees * 3,000 lbs/employee/yr                                   |
| <b>Restaurants</b>                                                                                                                                                                                                                                                                                                                                                            | Food waste (lbs/year) = N of employees * 3,000 lbs/employee/yr                                   |
| Notes: <sup>1</sup> See references for sources of waste generation estimates<br><sup>2</sup> 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. |                                                                                                  |

Such relationships have not been possible to develop for two generator categories: food manufacturers and processors, and food wholesalers and distributors:

***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. Aggregate waste generation estimates for the population of Massachusetts food processors and manufacturers are based on survey responses secured from individual generators. In the waste generation databases and maps, facilities in this category are recorded based on total annual sales.

***Food Wholesalers/Distributors.*** Based on data collected in this and other studies, it can be concluded that the majority of food wholesalers and distributors generate very little recyclable organic waste. Most of these establishments warehouse and redistribute pre-packaged items, with little or no organic waste generated. Some amount of waste is generated in a stream of damaged or returned products, but most of these are returned in their original packaging (and are therefore difficult to separate for composting or organics diversion), and much is ultimately returned to manufacturers for credit, eliminating the possibility of composting or organics diversion from the wholesale or distribution establishment.

On the basis of surveys developed for this analysis, it was decided to map and estimate waste generation from three categories of food wholesalers/distributors: fish and shellfish; vegetables; and meats (including eggs). As is true with manufacturers, there is wide variation in waste generation even within these categories, which cannot be related to any simple metric related to establishment size or sales. For this reason, aggregate waste generation estimates are based on survey responses from individual generators, but the larger population of generators are recorded and mapped with information on total annual sales, not on waste generation.

## FOOD WASTE COMPOSITION

Data on organic waste composition were derived from literature search and survey and phone contacts with individual Massachusetts 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). The only 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, some fish distributors report generation of significant quantities of bakery wastes, presumably from breaded fish products.

**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. Most of the balance is 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 Properties.** 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.

**Restaurants.** There is wide variability in the composition of food waste from restaurants. For example, most fast food restaurants used pre-portioned raw materials, and generate relatively small quantities of "pre-plate" wastes compared to restaurants that prepare meals on demand. Some restaurants prepare most meals to order; others pre-prepare the majority of their meals. Restaurants focusing on the dinner trade generate very different wastes than restaurants focusing on breakfast and/or lunch. In general, fruits and vegetables can be expected to comprise the majority of potentially recyclable "pre-plate" wastes, with significant additional contributions from bakery products, and smaller contributions of sugar- and starch-based products, confectionery, and dairy products.

**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 cited in composition studies that identify compostable wastes.

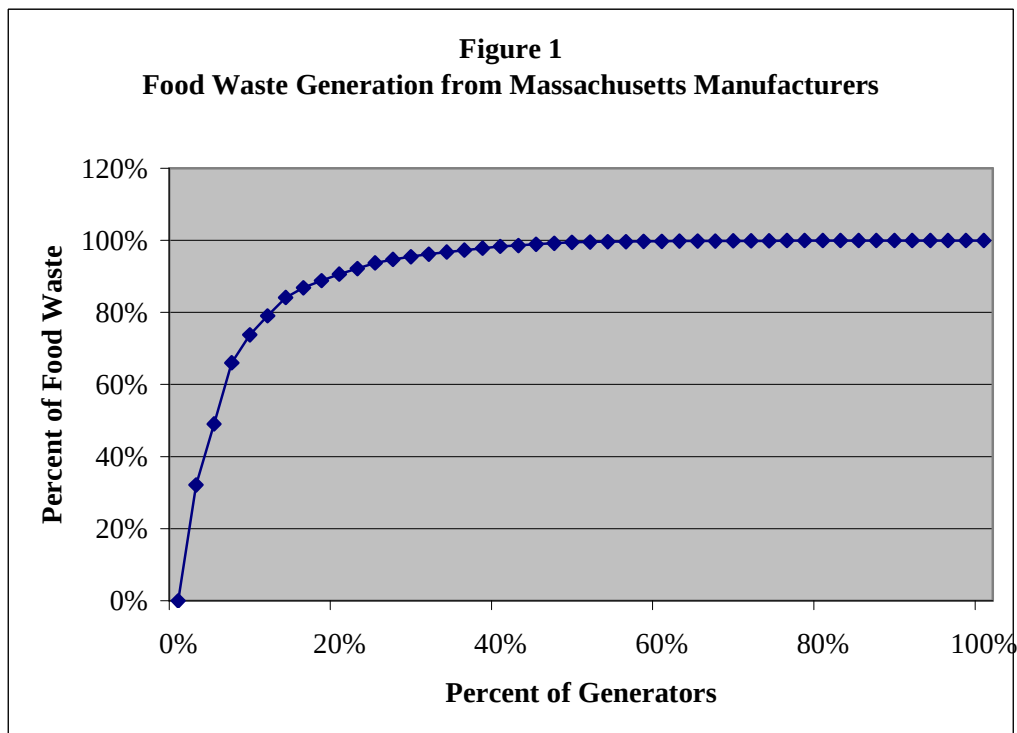
## STATEWIDE FOOD WASTE GENERATION ESTIMATES

The quantity of SSOM generated annually in Massachusetts from the subset of all Massachusetts food waste generators that was analyzed in this study is estimated to be 881,000 tons/year (Table 3).

| <b>Table 3</b><br><b>Summary of Massachusetts SSOM Generation from Generators Analyzed in Study</b> |                          |                                 |                                             |
|-----------------------------------------------------------------------------------------------------|--------------------------|---------------------------------|---------------------------------------------|
| Generator Category                                                                                  | Number of Establishments | Total SSOM Generation (tons/yr) | SSOM Generation Per Establishment (tons/yr) |
| Manufacturers / Processors                                                                          | 727                      | 493,698                         | 656                                         |
| Wholesalers / Distributors                                                                          | 304                      | 44,688                          | 147                                         |
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| Resorts / Conference Facilities                                                                     | 105                      | 6,442                           | 61                                          |
| Supermarkets                                                                                        |                          |                                 |                                             |
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| Restaurants                                                                                         | 3,320                    | 168,191                         | 51                                          |
| <b>TOTAL</b>                                                                                        | <b>5,799</b>             | <b>879,767</b>                  | <b>---</b>                                  |

Nearly 60% of these wastes, nearly 500,000 tons/year, are estimated to come from food manufacturers and processors. But this fact disguises great variability in this category.

Figure 1, which is drawn from survey information provided by Massachusetts food product manufacturers for this study, highlights the great concentration of food waste generation from the food manufacturing sector. Over half of the food waste reported comes from only five percent of the generators, and over 75% of the reported food waste comes from the top ten percent of generators.



This fact has meaningful implications for targeting the most promising generators for composting or organics diversion. While the mean food waste generation for all Massachusetts food manufacturers is an estimated 656 tons/establishment/year, this value is inflated by the presence of a small number of manufacturers with very large waste streams. The large majority of manufacturers produce much less than this value. Based on surveys conducted for this study, only twenty-five percent of all food manufacturers generate as much as 300 tons of food waste per year, and half of all manufacturers generate no more than 25-35 tons/year of organic wastes. Any composting or other organics diversion initiatives planned among manufacturers would be well advised to identify and target the relatively small number of firms that generate the majority of Massachusetts' manufacturing food waste, with much less attention devoted to the large number of firms that are in fact quite small waste generators. And even among large generators, the potential to source food wastes from manufacturers must be evaluated on a case-by-case basis, for a variety of reasons:

- There is no easy means to predict food waste generation on the basis of sales, employment, or other readily measurable yardsticks. Food waste generation can vary widely depending on the nature of specific products, technologies employed, and other variables specific to individual establishments.
- Contamination can be a serious issue. For example, food wastes from some manufacturers are generated in packaged containers, and removing packaging can be a serious obstacle to successful diversion. Other manufacturers may mix food wastes with other process or non-process wastes, and separation of food waste for composting or other diversion can be costly.
- Because of the expense associated with food waste disposal, some number of large manufacturers have already identified and implemented composting or other organics diversion

alternatives. This is particularly true among manufacturers whose products have nutritional value (e.g., bakery products, brewers grains), where an infrastructure to divert wastes to use as animal feed is relatively well established.

Apart from manufacturers, three other generator categories also stand out:

**Supermarkets:** Depending on the treatment of food manufacturing waste estimates, the 409 supermarkets accounted for in this study generate some 11% of all food waste generated in Massachusetts. Further, these generators are concentrated among a relatively small number of firms: the top eleven supermarket chains in the state account for 80% of all individual stores, and generate over 90% of the food wastes from this generator category. Supermarkets also tend to be concentrated in a predictable pattern, closely following the concentration of population, and generate a relatively consistent and predictable set of wastes. For all of these reasons, supermarkets are a logical target for food waste composting or organics diversion initiatives.

**Colleges and universities:** Colleges and universities stand out because of their relatively large individual size (average food waste generation = 242 tons per year). This value masks considerable diversity, however. The five largest universities in the state are each estimated to generate over 1,000 tons of food waste per year – cumulatively over one-third of all food waste from this generator category. Meanwhile, forty of the smallest colleges/universities in the state (or 40% of all institutions) each generate less than 100 tons of food waste per year, and account in total for only about 7% of all food waste from this category. From the perspective of food waste diversion, colleges and universities present additional challenges from two perspectives; first, food waste is typically generated from a large number of individual kitchens or cafeterias on a single campus; and second, contamination can be predicted to be a serious issue for most pre- and post-plate food waste from this set of generators.

**Restaurants:** Restaurants account for about 19% of all food waste generated in Massachusetts. Restaurants are also, by far, the most numerous generators of food waste in the Commonwealth. This situation presents both challenges and opportunities. On the one hand, restaurants present significant challenges related to contamination and to collection of small quantities of wastes from individual generators. On the other hand, because of their density and their significant contribution to local waste totals, restaurants may be logical targets for locally-organized and managed composting or other organics diversion initiatives.

## **FOOD WASTE DATABASE AND GEOGRAPHIC INFORMATION SYSTEM CAPABILITIES**

Information about SSOM generators was assembled in a Microsoft Access database to allow for comprehensive facility tracking, research, data querying, and generation of Geographic Information System (GIS) maps. For each identified generator, the SSOM generator database contains the following information:

- Company/organization name, address, and contact information;
- Establishment location (latitude and longitude) coded in both decimal degrees and X and Y coordinates (State Plane NAD-83);
- 8-Digit Standard Industrial Classification (SIC) code and SIC code description;

- Establishment size, coded as sales range (manufacturers, wholesalers), employee range (manufacturers, wholesalers, supermarkets and grocery stores, restaurants), number of beds (hospitals, nursing homes), number of students (colleges/universities, independent preparatory schools), number of inmates (prisons), or banquet-style seating capacity (resorts/conference facilities);
- Food waste types;
- Food waste generation estimate (all institutions except manufacturers and wholesalers).

The database was assembled for two primary purposes. The first is to provide comprehensive data query and manipulation capabilities through the Access database system. For example, these allow users of the database to design and run comprehensive queries, sorting and summing routines that can provide detailed information on food waste generation in Massachusetts by location (zip code, town, etc.), generator type, food waste type, or other variables.

The second major purpose of the database is to link to a Geographic Information System (GIS), ArcView version 3.2a, that can graphically display food waste generators by generator type, waste type, waste generation estimates, and a variety of other attributes. With the GIS system, generators can be portrayed on base maps that contain features such as local roads and streets, major statewide traffic arteries, and town boundaries. Users of the linked database/GIS system can view generator locations at scales ranging from generalized statewide maps to large scale maps that pinpoint generator locations on individual streets. With the ArcView information tool, users can also obtain generator-specific information on any mapped generator, and can create customized hard copy and on-screen maps to display generator locations with symbols selected and scaled to show any desired generator attribute data (generator type, waste type, size, waste generation, etc.).

Probably the most useful applications of the database/GIS system are to be found in the combination of data query and mapping capabilities. For example, a query such as “waste generation greater than 83 tons/year and sales code note equal to A, B, C, D, or E” was used to generate the statewide map of large scale generators presented as Map 1. Additional GIS mapping capabilities were then used to map a subset of these generators onto local road systems in a smaller portion of the state (Map 3), a feature that can be used, for example, to help lay out logical collection routes. The combination of query and mapping capabilities can be used iteratively to carry out quite sophisticated analyses of food waste generation in Massachusetts, particularly focusing on the practical aspects of identifying generators who are logical targets (by virtue of location, waste types, waste quantities, and other features) for composting or other organics diversion initiatives.

Appendices B and C provide more detailed information about development of the SSOM generator database, its contents, and the related GIS mapping capabilities developed in this project.

## **DATABASE UPDATE PLAN**

The following paragraphs summarize the sources of information used in this analysis, which can be accessed again in the future to update mapping and demographic information contained in the SSOM generator database. To optimize utility of the database and mapping capabilities, the database should be updated frequently enough to assure that most establishments recorded are still in business and maintaining their current level of economic activity. Based on industry turnover rates and the importance

of their contribution to statewide SSOM generation, Draper/Lennon suggests the following update schedule to assure the continuing relevance of the database and mapping results of this project (Table 4).

| <p><b>Table 4</b><br/><b>Suggested Update Frequency, Massachusetts SSOM Generator Database</b></p> |                        |
|----------------------------------------------------------------------------------------------------|------------------------|
| <b>Generator Category</b>                                                                          | <b>Update Schedule</b> |
| Manufacturers / Processors                                                                         | Every 2 years          |
| Wholesalers / Distributors                                                                         | Every 2 years          |
| Hospitals                                                                                          | Every 5 years          |
| Nursing Homes and Related Facilities                                                               | Every 5 years          |
| Colleges and Universities                                                                          | Every 5 years          |
| Independent Preparatory Schools                                                                    | Every 5 years          |
| Correctional Institutions                                                                          | Every 5 years          |
| Resorts / Conference Facilities                                                                    | Every 3-5 years        |
| Supermarkets                                                                                       | Every 2 years          |
| Restaurants                                                                                        | Annual                 |

**Food and Beverage Manufacturers and Processors and Food Wholesalers and Distributors.** The Connecticut Economic Resource Center (CERC, [www.cerc.com](http://www.cerc.com)) maintains a database of business and service establishments in Massachusetts and other states that was the source of the majority of information in these generator categories. Information from CERC was supplemented by additional data derived from public web sources and search engines, industry sources such as Thomas's Register of American Manufacturers, and trade associations

**Hospitals.** The majority of information used in this study was provided by the member relations department of the Massachusetts Hospital Association ([www.mhalink.org](http://www.mhalink.org)), supplemented by information from the American Hospital Directory ([www.ahd.com](http://www.ahd.com)), and additional information from the American Hospital Association ([www.hospitalconnect.com](http://www.hospitalconnect.com)). Direct contact with a number of hospitals or their web sites was employed to confirm some database-derived information.

**Nursing Homes.** The federal Medicare program maintains a comprehensive database of all Medicare-certified nursing homes and related extended care facilities in the United States. This database ([www.medicare.gov/Nursing/Overview.asp](http://www.medicare.gov/Nursing/Overview.asp)) was the source of the information used in this study.

**Colleges and Universities.** Information was taken from the National Center for Education Statistics ([www.nces.ed.gov](http://www.nces.ed.gov)), supplemented by information from the Massachusetts Department of Higher Education ([www.mass.edu](http://www.mass.edu)), and the New England Association of Schools and Colleges, ([www.neasc.org](http://www.neasc.org)). Contacts with a number of individual schools (web site or school registrar) were required to confirm address, contact, or current enrollment information.

**Major Independent Secondary Schools.** The Association of Independent Schools of New England, ([www.aisne.org](http://www.aisne.org)) was the source of most information. Schools that are not AISNE members were identified and characterized through the American School Directory ([www.asd.com](http://www.asd.com)) and contacts with the individual schools, the Massachusetts Department of Higher Education, and/or the National Center for Education Statistics.

**Correctional Facilities.** The Massachusetts Department of Correction, office of the Assistant Deputy Commissioner, Community Correction Division, provided address and inmate count information for all of the facilities in the Massachusetts prison system.

**Major Resort and Conference Properties.** Facilities were identified by contacting the Convention and Visitors Bureaus in the major metropolitan areas and rural recreational regions in Massachusetts (Boston Metro, Worcester Area, Pittsfield/Berkshires, Cape Cod, etc.). These contacts provided the names of all resort/conference properties in each region, and in some cases provided data on the number of banquet-style seats at each facility. Where published information did not include data on banquet seating, individual establishments were contacted to secure this information.

**Restaurants.** Data were provided by CERC.

**Supermarkets.** Base data were provided by CERC. For ten of the major supermarket chains in Massachusetts, Draper/Lennon established direct contact (typically with the chain's environmental coordinator) and requested information to update and correct the CERC-derived information. The following chains provided such information: A&P (Waldbaum's), Big Y, Bread & Circus, Foodmaster, Market Basket, Price Chopper, Roche Brothers, Shaw's/Star Market, Shop n Save, and Stop n Shop.

## CONCLUSIONS

This study identified a total of 5,799 commercial and institutional generators of food waste in Massachusetts, who produce an estimated 880,000 tons/year of source separated organic materials potentially suitable for composting or organics diversion. 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 these results, enough SSOM is generated in Massachusetts to support composting or organics diversion efforts, either dedicated exclusively to SSOM, or for SSOM mixed and recycled with other organics (e.g., leaf and yard wastes).

The major SSOM generating sectors in Massachusetts include manufacturers, restaurants, and supermarkets. There is great diversity among food manufacturers, and the majority of wastes from this sector are produced by a relatively small number of large generators. Supermarkets are the source of nearly 100,000 tons/year of compostable organics, and from the standpoint of organics diversion offer advantages in that they represent a consistent and predictable waste stream, and the majority of wastes come from a relatively small number of supermarket chains. In total, restaurants generate nearly 170,000 tons/year of organics, but are relatively difficult targets for recycling because of their generally small size and issues related to recycling logistics, sanitation, and contamination.

The combination of database information and Geographic Information System capabilities provided by this study has also provided the state with a flexible and powerful tool to identify, characterize, and map SSOM by location, generator type, generator size, waste type, and other variables – a tool that can be used by current or prospective SSOM recyclers, SSOM generators, haulers, and waste management planners. This combination of database and GIS products provide the State of Massachusetts and private companies with an opportunity to create composting or organics diversion markets for SSOM in Massachusetts, and to create jobs and economic activity centered on this opportunity.

## References

Note: Bold-faced abbreviations after each citation refer to the types of generators discussed in each document, as follows: **M**=Manufacturers/Processors, **HC**=Health Care (hospitals, nursing homes), **ED**=Education, **PR**=Prisons, **RC**=Resort/Conference, **R**=Restaurant, **SM**=Supermarket.

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## **Appendix A**

### **Detailed Information on Massachusetts Manufacturer/Processor, Wholesaler/Distributor, and Restaurant Food Waste Generator Categories**

| Table A-1<br>Massachusetts Food and Beverage Manufacturers and Processors by SIC Code and Size (Sales) |                           |           |            |           |           |           |           |           |           |          |            |            |                                                         |
|--------------------------------------------------------------------------------------------------------|---------------------------|-----------|------------|-----------|-----------|-----------|-----------|-----------|-----------|----------|------------|------------|---------------------------------------------------------|
| SIC                                                                                                    | Annual Sales (Million \$) |           |            |           |           |           |           |           |           |          |            | Total      | SIC Description                                         |
|                                                                                                        | <0.49                     | .5-99     | 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    | Unknown    |            |                                                         |
| 2011                                                                                                   | 0                         | 0         | 2          | 5         | 4         | 3         | 5         | 0         | 1         | 0        | 12         | 32         | Meat packing plants                                     |
| 2013                                                                                                   | 1                         | 6         | 5          | 3         | 5         | 2         | 1         | 0         | 0         | 0        | 13         | 36         | Sausages and meat products                              |
| 2015                                                                                                   | 0                         | 1         | 0          | 1         | 1         | 2         | 0         | 0         | 0         | 0        | 4          | 9          | Poultry slaughtering, dressing, and processing          |
| 2022                                                                                                   | 0                         | 0         | 1          | 1         | 0         | 0         | 0         | 0         | 1         | 0        | 1          | 4          | Cheese                                                  |
| 2023                                                                                                   | 0                         | 0         | 0          | 0         | 0         | 0         | 0         | 0         | 0         | 0        | 1          | 1          | Dry, condensed, and evaporated dairy products           |
| 2024                                                                                                   | 8                         | 5         | 3          | 6         | 3         | 2         | 3         | 1         | 0         | 0        | 22         | 53         | Ice cream                                               |
| 2026                                                                                                   | 0                         | 0         | 1          | 2         | 1         | 0         | 0         | 0         | 1         | 2        | 9          | 16         | Fluid milk                                              |
| 2032                                                                                                   | 1                         | 1         | 1          | 1         | 1         | 1         | 0         | 0         | 0         | 0        | 1          | 7          | Canned specialties                                      |
| 2033                                                                                                   | 1                         | 1         | 5          | 8         | 1         | 12        | 2         | 0         | 1         | 1        | 4          | 36         | Canned fruits, vegetables, and preserves                |
| 2034                                                                                                   | 0                         | 0         | 1          | 0         | 0         | 0         | 0         | 0         | 0         | 0        | 0          | 1          | Dried and dehydrated fruits, vegetables, and soup mixes |
| 2035                                                                                                   | 1                         | 0         | 2          | 0         | 4         | 0         | 0         | 0         | 0         | 0        | 2          | 9          | Pickles, sauces, and salad dressings                    |
| 2037                                                                                                   | 0                         | 0         | 1          | 0         | 0         | 0         | 0         | 0         | 0         | 0        | 1          | 2          | Fruit juices                                            |
| 2038                                                                                                   | 1                         | 1         | 1          | 0         | 1         | 1         | 1         | 0         | 0         | 0        | 2          | 8          | Frozen specialties                                      |
| 2041                                                                                                   | 0                         | 0         | 0          | 0         | 1         | 0         | 0         | 0         | 1         | 0        | 2          | 4          | Flour, grain milling                                    |
| 2043                                                                                                   | 0                         | 0         | 2          | 0         | 0         | 1         | 0         | 0         | 1         | 0        | 0          | 4          | Cereal breakfast foods                                  |
| 2044                                                                                                   | 0                         | 0         | 0          | 0         | 0         | 0         | 0         | 0         | 0         | 0        | 1          | 1          | Rice milling                                            |
| 2045                                                                                                   | 0                         | 0         | 0          | 0         | 0         | 0         | 0         | 0         | 0         | 0        | 3          | 3          | Prepared flour mixes and doughs                         |
| 2046                                                                                                   | 0                         | 0         | 0          | 0         | 0         | 0         | 0         | 0         | 0         | 0        | 2          | 2          | Wet corn milling                                        |
| 2047                                                                                                   | 0                         | 0         | 0          | 0         | 0         | 1         | 0         | 0         | 0         | 0        | 1          | 2          | Dog and cat food                                        |
| 2048                                                                                                   | 0                         | 0         | 0          | 0         | 1         | 0         | 1         | 0         | 0         | 0        | 1          | 3          | Other prepared feeds                                    |
| 2051                                                                                                   | 17                        | 10        | 22         | 12        | 9         | 7         | 1         | 0         | 0         | 0        | 75         | 153        | Bread, cake, and related products                       |
| 2052                                                                                                   | 1                         | 4         | 2          | 0         | 1         | 0         | 0         | 0         | 0         | 0        | 11         | 19         | Cookies and crackers                                    |
| 2053                                                                                                   | 0                         | 2         | 0          | 0         | 0         | 0         | 0         | 0         | 0         | 0        | 2          | 4          | Frozen bakery products                                  |
| 2063                                                                                                   | 0                         | 0         | 0          | 0         | 0         | 0         | 0         | 0         | 0         | 0        | 1          | 1          | Beet sugar                                              |
| 2064                                                                                                   | 8                         | 8         | 6          | 3         | 0         | 2         | 0         | 0         | 0         | 0        | 10         | 37         | Candy and other confectionery products                  |
| 2066                                                                                                   | 3                         | 1         | 1          | 1         | 0         | 0         | 0         | 0         | 0         | 0        | 9          | 15         | Chocolate and cocoa products                            |
| 2068                                                                                                   | 0                         | 0         | 2          | 1         | 0         | 1         | 0         | 0         | 1         | 0        | 0          | 5          | Salted and roasted nuts and seeds                       |
| 2077                                                                                                   | 1                         | 1         | 0          | 2         | 0         | 0         | 0         | 0         | 0         | 0        | 1          | 5          | Animal and marine fats and oils                         |
| 2079                                                                                                   | 0                         | 0         | 0          | 0         | 1         | 0         | 2         | 0         | 0         | 0        | 0          | 3          | Vegetable oils                                          |
| 2082                                                                                                   | 1                         | 4         | 8          | 2         | 1         | 2         | 0         | 0         | 2         | 0        | 7          | 27         | Malt beverages                                          |
| 2084                                                                                                   | 2                         | 3         | 2          | 1         | 1         | 0         | 0         | 0         | 0         | 0        | 2          | 11         | Wines, brandy, and brandy spirits                       |
| 2085                                                                                                   | 0                         | 1         | 1          | 0         | 2         | 0         | 0         | 0         | 0         | 0        | 3          | 7          | Distilled and blended liquors                           |
| 2086                                                                                                   | 0                         | 1         | 0          | 1         | 2         | 1         | 0         | 0         | 1         | 0        | 7          | 13         | Bottled and canned soft drinks                          |
| 2087                                                                                                   | 0                         | 0         | 0          | 1         | 1         | 0         | 1         | 0         | 0         | 0        | 4          | 7          | Flavoring extracts and syrups                           |
| 2091                                                                                                   | 0                         | 1         | 3          | 1         | 0         | 0         | 0         | 0         | 0         | 0        | 6          | 11         | Canned and cured fish and seafoods                      |
| 2092                                                                                                   | 1                         | 1         | 12         | 7         | 7         | 8         | 5         | 0         | 0         | 0        | 19         | 60         | Fresh or frozen packaged fish                           |
| 2095                                                                                                   | 1                         | 2         | 2          | 3         | 3         | 0         | 0         | 1         | 0         | 0        | 8          | 19         | Coffee                                                  |
| 2096                                                                                                   | 3                         | 0         | 1          | 1         | 0         | 1         | 0         | 0         | 0         | 0        | 4          | 10         | Potato chips and similar snacks                         |
| 2098                                                                                                   | 2                         | 4         | 7          | 0         | 1         | 0         | 0         | 0         | 0         | 0        | 5          | 19         | Macaroni and spaghetti                                  |
| 2099                                                                                                   | 5                         | 6         | 11         | 6         | 7         | 4         | 4         | 0         | 0         | 0        | 24         | 67         | Other food preparations                                 |
| <b>Total</b>                                                                                           | <b>58</b>                 | <b>64</b> | <b>105</b> | <b>69</b> | <b>59</b> | <b>51</b> | <b>26</b> | <b>2</b>  | <b>10</b> | <b>3</b> | <b>280</b> | <b>727</b> |                                                         |

| <b>Table A-2</b><br><b>Massachusetts Food Wholesalers and Distributors by SIC Code and Size (Sales)</b><br>See Note 1                                                                                                                                                                                                                                                                                                                                                   |                           |           |           |           |           |           |           |          |           |           |            |                             |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|-----------|-----------|-----------|-----------|-----------|-----------|----------|-----------|-----------|------------|-----------------------------|
| SIC Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Annual Sales (Million \$) |           |           |           |           |           |           |          |           |           | Total      | SIC Description             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <0.49                     | .5-.99    | 1.0-2.49  | 2.5-4.99  | 5.0-9.99  | 10-24.9   | 25-49.9   | 50-99.9  | 100-249.9 | Unknown   |            |                             |
| 5143                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 0                         | 2         | 2         | 3         | 4         | 2         | 0         | 0        | 0         | 4         | 17         | Dairy products              |
| 5144                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 0                         | 1         | 1         | 5         | 1         | 1         | 1         | 0        | 0         | 0         | 10         | Eggs and poultry            |
| 5146                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 3                         | 7         | 42        | 25        | 25        | 16        | 8         | 1        | 2         | 15        | 144        | Fish and seafoods           |
| 5147                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 0                         | 0         | 3         | 2         | 3         | 2         | 2         | 0        | 0         | 1         | 13         | Meats                       |
| 5148                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 2                         | 5         | 21        | 17        | 15        | 11        | 4         | 3        | 0         | 13        | 91         | Fresh fruits and vegetables |
| 5149                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 1                         | 8         | 9         | 2         | 0         | 1         | 0         | 0        | 0         | 8         | 29         | Bakery products             |
| <b>Total</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>6</b>                  | <b>23</b> | <b>78</b> | <b>54</b> | <b>48</b> | <b>33</b> | <b>15</b> | <b>4</b> | <b>2</b>  | <b>41</b> | <b>304</b> |                             |
| Notes: <sup>1</sup> Selected SICs only. Review of survey information returned by Massachusetts wholesalers/distributors determined that establishments in most SICs generate very little recyclable organic waste. Only establishments handling meat, fish, dairy, bakery, and fruits/vegetables are likely to generate organics in quantities potentially recoverable for composting or organics diversion; only these SICs are accounted for in this study. See text. |                           |           |           |           |           |           |           |          |           |           |            |                             |

| Table A-3<br>Massachusetts Restaurants by Type and Size (Number of Employees) |                     |       |       |       |      |       |                                                |
|-------------------------------------------------------------------------------|---------------------|-------|-------|-------|------|-------|------------------------------------------------|
| SIC Code                                                                      | Number of Employees |       |       |       |      |       | SIC Description                                |
|                                                                               | <15                 | 15-24 | 25-49 | 50-99 | 100+ | Total |                                                |
| 5812-0000                                                                     | 259                 | 243   | 283   | 140   | 42   | 967   | Eating places, not otherwise classified        |
| 5812-0100                                                                     | 10                  | 6     | 9     | 1     | 1    | 27    | Ethnic food restaurants                        |
| 5812-0101                                                                     | 28                  | 42    | 64    | 72    | 19   | 225   | American restaurant                            |
| 5812-0103                                                                     | 69                  | 48    | 26    | 9     | 1    | 153   | Chinese restaurant                             |
| 5812-0104                                                                     | 2                   | 2     | 6     | 5     | 0    | 15    | French restaurant                              |
| 5812-0105                                                                     | 0                   | 0     | 2     | 0     | 0    | 2     | German restaurant                              |
| 5812-0106                                                                     | 5                   | 2     | 0     | 0     | 1    | 8     | Greek restaurant                               |
| 5812-0107                                                                     | 5                   | 3     | 0     | 0     | 0    | 8     | Indian/Pakistan restaurant                     |
| 5812-0108                                                                     | 35                  | 42    | 114   | 40    | 8    | 239   | Italian restaurant                             |
| 5812-0109                                                                     | 2                   | 5     | 7     | 2     | 0    | 16    | Japanese restaurant                            |
| 5812-0112                                                                     | 8                   | 12    | 14    | 4     | 2    | 40    | Mexican restaurant                             |
| 5812-0113                                                                     | 1                   | 0     | 1     | 0     | 0    | 2     | Spanish restaurant                             |
| 5812-0114                                                                     | 1                   | 0     | 0     | 0     | 0    | 1     | Sushi bar                                      |
| 5812-0115                                                                     | 6                   | 5     | 1     | 1     | 0    | 13    | Thai restaurant                                |
| 5812-0116                                                                     | 1                   | 3     | 0     | 0     | 0    | 4     | Vietnamese restaurant                          |
| 5812-0200                                                                     | 1                   | 4     | 1     | 0     | 0    | 6     | Ice cream, soft drink and soda fountain stands |
| 5812-0201                                                                     | 1                   | 1     | 1     | 2     | 0    | 5     | Concessionaire                                 |
| 5812-0202                                                                     | 2                   | 0     | 0     | 0     | 0    | 2     | Frozen yogurt stand                            |
| 5812-0203                                                                     | 18                  | 15    | 14    | 1     | 0    | 48    | Ice cream stands or dairy bars                 |
| 5812-0300                                                                     | 2                   | 6     | 4     | 1     | 1    | 14    | Fast-food restaurants and stands               |
| 5812-0302                                                                     | 1                   | 5     | 2     | 1     | 0    | 9     | Carry-out only (except pizza) restaurant       |
| 5812-0304                                                                     | 13                  | 20    | 27    | 3     | 0    | 63    | Coffee shop                                    |
| 5812-0305                                                                     | 11                  | 9     | 3     | 1     | 0    | 24    | Delicatessen (eating places)                   |
| 5812-0306                                                                     | 1                   | 2     | 2     | 0     | 0    | 5     | Drive-in restaurant                            |
| 5812-0307                                                                     | 26                  | 34    | 198   | 58    | 2    | 318   | Fast-food restaurant, chain                    |
| 5812-0308                                                                     | 2                   | 2     | 3     | 1     | 0    | 8     | Fast-food restaurant, independent              |
| 5812-0309                                                                     | 0                   | 0     | 3     | 0     | 0    | 3     | Food bars                                      |
| 5812-0310                                                                     | 3                   | 7     | 8     | 5     | 0    | 23    | Grills (eating places)                         |
| 5812-0311                                                                     | 1                   | 0     | 0     | 0     | 0    | 1     | Hamburger stand                                |
| 5812-0312                                                                     | 2                   | 0     | 1     | 0     | 0    | 3     | Hot dog stand                                  |
| 5812-0313                                                                     | 23                  | 13    | 9     | 1     | 1    | 47    | Sandwiches and submarines shop                 |
| 5812-0315                                                                     | 1                   | 0     | 0     | 0     | 0    | 1     | Snack shop                                     |
| 5812-0400                                                                     | 2                   | 1     | 1     | 0     | 0    | 4     | Lunchrooms and cafeterias                      |
| 5812-0402                                                                     | 1                   | 0     | 1     | 0     | 0    | 2     | Cafeteria                                      |
| 5812-0403                                                                     | 3                   | 8     | 0     | 0     | 0    | 11    | Luncheonette                                   |
| 5812-0500                                                                     | 11                  | 10    | 36    | 20    | 1    | 78    | Family restaurants, not otherwise classified   |
| 5812-0501                                                                     | 1                   | 1     | 124   | 43    | 9    | 178   | Restaurant, family: chain                      |
| 5812-0502                                                                     | 13                  | 32    | 61    | 25    | 8    | 139   | Restaurant, family: independent                |
| 5812-0600                                                                     | 48                  | 26    | 24    | 30    | 1    | 129   | Pizza restaurants                              |
| 5812-0601                                                                     | 4                   | 4     | 23    | 18    | 0    | 49    | Pizzeria, chain                                |
| 5812-0602                                                                     | 6                   | 13    | 3     | 0     | 0    | 22    | Pizzeria, independent                          |
| 5812-0700                                                                     | 18                  | 25    | 28    | 25    | 12   | 108   | Seafood restaurants                            |
| 5812-0702                                                                     | 1                   | 0     | 3     | 4     | 0    | 8     | Seafood shack                                  |
| 5812-0800                                                                     | 1                   | 0     | 0     | 0     | 0    | 1     | Steak and barbecue restaurants                 |
| 5812-0801                                                                     | 2                   | 1     | 1     | 0     | 1    | 5     | Barbecue restaurant                            |
| 5812-0802                                                                     | 2                   | 4     | 17    | 13    | 4    | 40    | Steak restaurant                               |
| 5812-9901                                                                     | 3                   | 1     | 1     | 8     | 0    | 13    | Buffet (eating places)                         |
| 5812-9902                                                                     | 16                  | 7     | 28    | 6     | 0    | 57    | Cafe                                           |
| 5812-9903                                                                     | 28                  | 34    | 29    | 22    | 8    | 121   | Caterers                                       |
| 5812-9904                                                                     | 0                   | 1     | 5     | 0     | 0    | 6     | Chicken restaurant                             |
| 5812-9905                                                                     | 1                   | 1     | 2     | 0     | 0    | 4     | Commissary restaurant                          |
| 5812-9906                                                                     | 0                   | 2     | 8     | 6     | 3    | 19    | Contract food services                         |
| 5812-9907                                                                     | 8                   | 5     | 4     | 3     | 0    | 20    | Diner                                          |
| 5812-9908                                                                     | 0                   | 0     | 2     | 1     | 0    | 3     | Dinner theater                                 |
| 5812-9909                                                                     | 1                   | 0     | 2     | 0     | 0    | 3     | Health food restaurant                         |
| <b>Total</b>                                                                  | 710                 | 707   | 1,206 | 572   | 125  | 3,320 |                                                |

**Appendix B**  
**Detailed Description of GIS Mapping Capabilities and Protocols**

## **APPENDIX B**

### **Detailed Description of GIS Mapping Capabilities and Protocols**

#### **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 (1:1,520,000) to detailed street levels (1:24,000) and immediately obtain generator-specific information. 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 Worcester, 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.

#### **Creation of Access Database**

The SSOM generator data were obtained and edited by Draper/Lennon Inc. Each data source had 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 (WasteTypes), waste quantity generated (GenerationEstimate), and current disposal practices (Disposition). 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*', contains one MS-Access database table titled '*SSOM\_Generators*', for the SSOM generators, and two queries associated with this table. Appendix C 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/college = IC, food manufacturers = F, etc.); Facility Code (*DEPCode*), a unique identifier for each facility in the database; and Data Source Code (*SCode*), for specific numbering based on the data source (Appendix B, Table 2).

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: Town = 'Springfield' and Waste Quantity >'1,000'. The queries are linked to the GIS mapping platform, so the datasets returned from these queries will be reflected in the GIS maps produced.

### **Creation of GIS Base-Map Data**

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 Massachusetts (Mainland) State Plane coordinate system in meters, using the North American Datum of 1983 (NAD83). This is the standard system used by MassGIS and MADEP. Each data point is coded with information specified in the Draft MADEP GIS 'Point Data Documentation Standards - January 1, 2002'. All of the GIS data generated by this project is Development Level Data and is named and coded as such.

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 Massachusetts roads and highways. The state and town boundary layer is located in the following directory: ...\\Basemap\\Town Boundaries\\townsp1.shp. One of the road network layers is the MassGIS small-scale road data located in the directory titled ...\\Basemap\\Road\\majmhda1.shp. This road data is used for small-scale, countywide and statewide mapping. For the larger scale maps, the 2000 TIGER/Line road data (compiled by the U.S. Census Bureau) is used to allow for detailed viewing of local roads. The TIGER road data is located in the directory ...\\Basemap\\Road\\allroadstgr.shp. The viewing scale at which the road base-maps change is set to 1:100,000.

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

### **GIS Data Layer Development**

The SSOM generator locations in latitude-longitude coordinates were obtained from the original data source, by an address matching/geo-coding process, or by on-screen digitizing from digital USGS 1:24,000 scale topographic maps. Address matching applies 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, to determine approximate locations. 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. Address matching was performed with proprietary geo-referenced road line data maintained by Geographic Data Technology, Inc. (GDT) and with 2000 TIGER/Line data. For representation on the GIS maps, the geo-coded locations were projected from latitude/longitude to the Massachusetts (Mainland) State Plane - meters 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 to the nearest meter.

All of the generators were submitted to GDT for address matching with the geo-coding process. Approximately 7.3% of the data did not match to the street address level of coding with GDT street data. Un-matched data were reviewed for address accuracy, edited where possible, and



resubmitted to GDT. Address matching with the TIGER/Line data was attempted with the remaining unmatched data. If the unmatched data had coordinates from the original data source, they were used and coded appropriately. The generators that did not match to the street address and could not have original coordinates were assigned zip-code centroid locations as provided by GDT.

Some of the generators that were not successfully located with the geo-coding process and did not have original coordinates were accurately mapped using USGS topographic maps. This was particularly effective for schools that were labeled on the USGS maps.

The locations of most of hospitals and prisons were provided by the existing MADEP GIS data. 17 of the 126 hospitals that were not included in the MADEP data were address-matched by GDT.

The description and collection method of the location data for each SSOM generating establishment is recorded in the database in the fields named '*L\_Type*' and '*L\_Meth*' respectively, with the codes shown in Appendix A, Table 1.

Of the 2479 SSOM generators, not including restaurants, mapped in this project, 2165 were geo-coded to the street address. 130 facilities were mapped with the coordinates provided from the data source. 13 facility locations were corrected with USGS topographic maps and 30 facility locations were located to the most probable location along the known street. Nine facilities were located to the centroid of the five-digit zip code, and two were located to the centroid of the five-plus-two zip code. Also included in the database are 3320 restaurants. Of these, 3107 restaurants were located by address matching, 212 by their provided coordinates, and 1 by its 5-digit zip code centroid.

### **Generator Characterization**

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

### **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 3. These waste codes can be used to produce waste type maps.

### **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.

## **Results**

### **Generator and Waste Type Maps**

Three maps were generated for this report. Map 1 and 3 identify the large quantity generators as defined by criteria: greater than 83 tons/year for all facilities where generation rates could be estimated, and greater than \$10 million in sales for food and beverage manufacturers and wholesalers where waste generation rates could not be derived. These criteria were established by targeting the top 20% of the total number of generators.

### **GIS ArcView Shapefiles**

Eighteen shapefiles (.shp) were created with the current data for each generator category and each waste type. Legend files (.avl) were created for the generator categories and the waste

types. 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 4. All of the data present in the database is contained in the shapefile named ssom\_generators\_uc.shp.

| <b>Table 1</b><br><b>Location Data Codes</b> |                |                                                                                                                                                                                                                           |               |
|----------------------------------------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>L_Meth*</b>                               | <b>L_Type*</b> | <b>Description</b>                                                                                                                                                                                                        | <b>Number</b> |
| XY_4                                         | CB2            | 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.                                                        | 342           |
| AM_1                                         | AM             | Location obtained by address matching the street addresses with geo-coded street maps. Service provided by GDT, Inc.                                                                                                      | 5272          |
| DD_1                                         | CB             | Facility locations confirmed with USGS topographical maps where possible. This was especially effective with schools and hospitals.                                                                                       | 13            |
| AM_3                                         | AM             | 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. | 30            |
| AM_4                                         | AM             | Location recorded as the centroid of the 5+4 digit Zip Code                                                                                                                                                               | 0             |
| AM_5                                         | AM             | Location recorded as the centroid of the 5+2 digit Zip                                                                                                                                                                    | 2             |
| AM_6                                         | AM             | Location recorded as the centroid of the 5 digit Zip Code                                                                                                                                                                 | 10            |

\* Codes follow the MADEP GIS draft 'Point Data Documentation Standards - January 1, 2002'. L\_Meth codes AM\_4, AM\_5 and AM\_6 do not exist in this draft of standards.

The MADEP standard field 'L\_SRC\_1' is used to code the primary location source of the data. Draper/Lennon, Inc compiled the address data for this project from various data providers, thus the code used in this field is 'DB\_CONT' to indicate a contractor provided the database.

| <b>Table 2</b><br><b>SSOM Generator Characterization (CatCode) in Access Database</b> |                |                                                                                                                      |
|---------------------------------------------------------------------------------------|----------------|----------------------------------------------------------------------------------------------------------------------|
| <b>Generator Category</b>                                                             | <b>CatCode</b> | <b>Notes</b>                                                                                                         |
| Food Manufacturers/Processors<br>Beverage Man./Processors                             | F              | Labeled by SIC code into 34 categories.<br>Legend with sales code indicates size.                                    |
| Wholesalers/Distributors                                                              | W              | Labeled by SIC code into 6 categories.<br>Legend with sales code indicates size                                      |
| Health Care Facilities                                                                | IH             | <i>DEPCode</i> beginning with 'H' denotes<br>healthcare facility                                                     |
| Colleges/Universities                                                                 | IC             | <i>DEPCode</i> beginning with 'C' denotes college<br>or university                                                   |
| Independent Preparatory Schools                                                       | IS             | <i>DEPCode</i> beginning with 'S' denotes<br>independent school                                                      |
| Correctional Facilities                                                               | IP             | <i>DEPCode</i> beginning with 'P' denotes<br>correctional facility                                                   |
| Resort/Conference Facilities                                                          | C              | <i>DEPCode</i> beginning with 'I' denotes<br>resort/conference facility                                              |
| Supermarkets/Grocery Stores                                                           | G              | Code in <i>LocType</i> field denotes whether part<br>of a supermarket chain ('SC') or an<br>independent market ('S') |
| Restaurants                                                                           | R              | <i>SIC8Name</i> specifies the type of restaurant                                                                     |

| <b>Table 3</b><br><b>Waste Type Codes in the SSOM Generator Access Database</b> |                   |
|---------------------------------------------------------------------------------|-------------------|
| <b>Waste Type</b>                                                               | <b>Waste Code</b> |
| 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 Waste                                                       | G                 |
| Restaurant                                                                      | R                 |
| Other                                                                           | X                 |

| <b>Table 4</b><br><b>Shapefiles and Legend File Names</b> |                                              |
|-----------------------------------------------------------|----------------------------------------------|
| <b>GIS Shapefile Name</b>                                 | <b>Legend File Name</b>                      |
| ssom_generators_uc.shp                                    | ssom_generators-_uc.avl                      |
| food_uc.shp                                               | food_uc.avl                                  |
| wholesalers_uc.shp                                        | wholesalers_uc.avl                           |
| institutions_uc.shp                                       | institutions_uc.avl<br>institutewaste_uc.avl |
| resorts_uc.shp                                            | resorts_uc.avl<br>resortwaste_uc.avl         |
| restaurants_uc.shp                                        | restaurants_uc.avl                           |
| meatwaste_uc.shp                                          | meatwaste_uc.avl                             |
| fishwaste_uc.shp                                          | fishwaste_uc.avl                             |
| vegwaste_uc.shp                                           | vegwaste_uc.avl                              |
| bwwaste_uc.shp                                            | bwwaste_uc.avl                               |
| dairywaste_uc.shp                                         | dairywaste_uc.avl                            |
| sugstrchwaste_uc.shp                                      | sugstrchwaste<br>_uc.shp                     |
| bakerywaste_uc.shp                                        | bakerywaste_uc.avl                           |
| pastawaste_uc.shp                                         | astawaste_uc.avl                             |
| snackwaste_uc.shp                                         | snackwaste_uc.avl                            |
| supermarkets_uc.shp                                       | supermwaste_uc.avl<br>supermarkets_uc.avl    |
| otherwaste_uc.shp                                         | otherwaste_uc.avl                            |
| lrgquantgenerators_uc.shp                                 | lrgquantgenerators_uc.avl                    |

**Appendix C**  
**SSOM Generator Database Field Names And GIS Metadata**

## APPENDIX C

### 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 Massachusetts at the time of publication (July 2002). 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. The facility coordinates were obtained by matching the street addresses with geo-coded street maps. When address information did not match road data, the coordinates provided with the business data were used. 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. Codes for the geo-referencing methods are included in the attribute data fields named 'L\_Meth' and 'L\_Type'. 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.

---

#### Generator Points

**Data Type:** Feature

**Feature Type:** Point

**Data Format:** Shapefile

---

**Theme Attribute Table**

| Field             | Name                  | Description                            | Type   | Units           | Size   |
|-------------------|-----------------------|----------------------------------------|--------|-----------------|--------|
| <b>CatCode</b>    | Category Code         | Letter Identifier of Generator Type    | String |                 | 10     |
| <b>DEPCode</b>    | Manufacturer Code     | Unique Identifier of CT SSOM Generator | String |                 | 10     |
| <b>SCode</b>      | Source Code           | Source of Generator Data               | String |                 | 10     |
| <b>Name</b>       | Business Name         | Business Name                          | String |                 | 100    |
| <b>Address</b>    | Mailing Address       | Mailing Address                        | String |                 | 72     |
| <b>Town</b>       | Mailing City          | Mailing City                           | String |                 | 20     |
| <b>State</b>      | Mailing State         | Mailing State                          | String |                 | 2      |
| <b>MailZip9</b>   | Mailing Zip Code      | Mailing Zip Code                       | String |                 | 12     |
| <b>Phone</b>      | Phone Number          | Phone Number                           | String |                 | 20     |
| <b>ExecFull</b>   | Executive Full Name   | Full Name of Business Executive        | String |                 | 100    |
| <b>Exec Title</b> | Executive Title       | Executive Title                        | String |                 | 100    |
| <b>PhyAdd</b>     | Physical Address      | Physical Address of Business           | String |                 | 72     |
| <b>PhyCity</b>    | Physical City         | Physical City of Business Location     | String |                 | 20     |
| <b>PhyState</b>   | Physical State        | Physical State of Business Location    | String |                 | 2      |
| <b>PhyZip5</b>    | Physical Zip Code (5) | 5 Digit Zip Code of Business Location  | Number |                 | 5      |
| <b>PhyPlus4</b>   | Physical Zip Plus 4   | Plus 4 Zip Code of Business Location   | Number |                 | 4      |
| <b>Long</b>       | Longitude             | Longitude Coordinate of Business       | Number | Decimal Degrees | Double |
| <b>Lat</b>        | Latitude              | Latitude Coordinate of Business        | Number | Decimal Degrees | Double |
| <b>XCoord</b>     | X Coordinate          | X Coordinate (State Plane - NAD83)     | Number | Meters          | Double |
| <b>YCoord</b>     | Y Coordinate          | Y Coordinate (State Plane - NAD83)     | Number | Meters          | Double |



| Field                   | Name                          | Description                                                                             | Type   | Units | Size         |
|-------------------------|-------------------------------|-----------------------------------------------------------------------------------------|--------|-------|--------------|
| <b>SIC4</b>             | SIC 4 Digit Code              | Standard Industrial Classification                                                      | Number |       | Long Integer |
| <b>SIC4Name</b>         | SIC 4 Name                    | Standard Industrial Classification Description                                          | String |       | 100          |
| <b>SIC8</b>             | SIC 8 Digit Code              | Standard Industrial Classification                                                      | String |       | 12           |
| <b>SIC8Name</b>         | SIC 8 Digit Code              | Standard Industrial Classification Description                                          | String |       | 100          |
| <b>SalesCode</b>        | Sales Code                    | Sales Range by Code                                                                     | String |       | 10           |
| <b>EmplCode</b>         | Employee # Code               | Coded Number of Employees                                                               |        |       | 10           |
| <b>LocType</b>          | Location Type                 | Type of Location (single location, headquarters, branch plant, etc...)                  | String |       | 20           |
| <b>Inmates_Students</b> | Number of Inmates or Students | Inmates for Prison category Students for Colleges and Independent Schools categories    | Number |       | Long Integer |
| <b>Day_Brd</b>          | Day(D) or Boarding(B)         | Type of facility services - day or boarding                                             | String |       | 10           |
| <b>Beds_Seats</b>       | Number of Beds                | Number of beds/seats in Healthcare Facilities and Resorts/ConfCtrs                      | Number |       | Double       |
| <b>Meals/Student</b>    | Number of Meals per Student   | Number of meals per student in College/University category                              | Number |       | Double       |
| <b>Meals/Bed</b>        | Number of Meals per Bed       | Number of meals per bed in Healthcare and Resorts                                       | Number |       | Double       |
| <b>Meal/Day</b>         | Number of Meals per Day       | Number of meals per day in College/University, Healthcare and Resort/ConfCtr Facilities | Number |       | Double       |
| <b>Waste/Meal</b>       | Amount of Waste per Meal      | Weight of waste generated per meal                                                      | Number |       | Double       |
| <b>PerMealUnits</b>     | Units of Waste per Meal       | Units of Waste per Meal                                                                 | String |       | 10           |

| Field                      | Name                      | Description                                                                   | Type   | Units | Size   |
|----------------------------|---------------------------|-------------------------------------------------------------------------------|--------|-------|--------|
| <b>WasteType</b>           | Type of waste by code     | See waste type codes                                                          | String |       | 10     |
| <b>WasteQuantity</b>       | Quantity of waste         | Quantity of waste per unit                                                    | Number |       | Double |
| <b>Units_WasteQuantity</b> | Units                     | Units of Waste Quantity                                                       | String |       | 10     |
| <b>GenerationEstimate</b>  | Waste Generation Estimate | Estimate of annual food waste generation. Based on WasteQuantity calculations | Number |       | Double |
| <b>Units_Generation</b>    | Units                     | Units of Waste Generation Estimate. Typically tons/yr.                        | String |       | 20     |
| <b>Disposition</b>         | Disposition               | How Food Waste is Disposed                                                    | String |       | 10     |
| <b>Region</b>              | MADEP Region              | DEP GIS Standard Code                                                         | String |       | 4      |
| <b>L_TYPE</b>              | Location Type             | What the point represents                                                     | String |       | 4      |
| <b>L_METH</b>              | Location Method           | Method used to locate feature (i.e., AM_1= Address Matched)                   | String |       | 4      |
| <b>L_SRC_1</b>             | Primary Source Location   | Primary source of the location data                                           | String |       | 30     |
| <b>L_STAFF</b>             | Developer Name            | Person responsible for locating the site                                      | String |       | 16     |
| <b>L_PROG</b>              | Developer Program         | Program affiliation of the staff-person                                       | String |       | 16     |
| <b>L_DATE</b>              | Automation Date           | Date the feature was located/automated in GIS                                 | String |       | 8      |
| <b>L_COMM</b>              | Comments                  | Comments (i.e., description of data source or)                                | String |       | 40     |

### Horizontal Coordinate System

|                          |                                       |
|--------------------------|---------------------------------------|
| <b>Coordinate System</b> | State Plane Coordinate System of 1983 |
| <b>State Plane Zone</b>  | Massachusetts (Mainland - 2001)       |
| <b>Horizontal Datum</b>  | North American Datum of 1983 (NAD 83) |
| <b>Map Projection</b>    | Lambert Conformal Conic               |
| <b>Spheroid</b>          | GRS 80                                |
| <b>Map Scale</b>         |                                       |
| <b>Map Units</b>         | Meters                                |

### Point of Contact

|                        |                                                                                                    |
|------------------------|----------------------------------------------------------------------------------------------------|
| <b>Contact Person</b>  | Brian Brodeur                                                                                      |
| <b>Organization</b>    | State of Massachusetts Department of Environmental Protection Environmental Geographic Information |
| <b>Mailing Address</b> | One Winter St, Boston, MA 02108                                                                    |
| <b>Phone</b>           | (617)574-6802                                                                                      |
| <b>Fax</b>             |                                                                                                    |
| <b>Email</b>           |                                                                                                    |

### Facility Category Codes

| <b>CatCode</b> | <b>Category Description</b>                |
|----------------|--------------------------------------------|
| <b>F</b>       | Food and Beverage Manufacturers/Processors |
| <b>W</b>       | Wholesale Distributors                     |
| <b>IH</b>      | Institutions -Healthcare Facilities        |
| <b>IS</b>      | Institutions -Independent Schools          |
| <b>IC</b>      | Institutions -Colleges/Universities        |
| <b>IP</b>      | Institutions -Correctional Facilities      |
| <b>C</b>       | Resorts and Conference Facilities          |
| <b>G</b>       | Supermarkets and Grocery Stores            |
| <b>R</b>       | Restaurants                                |

### Location Documentation Codes

| <b>L_METH</b> | <b>L_TYPE</b> | <b>Description</b>                                                                                                                                                                                                                                                                                                    |
|---------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>AM_1</b>   | <b>AM</b>     | Location obtained by address matching the street addresses with geo-coded street maps. Service provided by GDT, Inc.                                                                                                                                                                                                  |
| <b>XY_4</b>   | <b>CB2</b>    | 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) |
| <b>DD_1</b>   | <b>CB</b>     | Facility locations confirmed with USGS topographical maps where possible. This was especially effective with schools and hospitals.                                                                                                                                                                                   |
| <b>AM_3</b>   | <b>AM</b>     | 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.                                                                                             |
| <b>AM_4</b>   | <b>AM</b>     | Location provided as the centroid of the 5+4 digit Zip Code (2)                                                                                                                                                                                                                                                       |
| <b>AM_5</b>   | <b>AM</b>     | Location provided as the centroid of the 5+2 digit Zip Code (2)                                                                                                                                                                                                                                                       |
| <b>AM_6</b>   | <b>AM</b>     | Location provided as the centroid of the 5 digit Zip Code (5)                                                                                                                                                                                                                                                         |

### Sales Codes

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

### Employment Codes

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

**Waste Type Code**

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

**Disposition Code**

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