

**FINAL  
REPORT**

**Fatal Flaw Analysis for Development of  
an Anaerobic Digester Facility at  
Hamilton Landfill Site**

Town of Hamilton,  
Massachusetts

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## Executive Summary

Over the past couple of years, the Town of Hamilton has implemented a curbside collection program for residential source separated organic wastes from their municipal solid waste stream. Concurrent with the start of this program, the Massachusetts Department of Environmental Protection (MassDEP) is proposing regulations to ban commercially-generated source separated organics such as food and vegetative waste from disposal at landfills and waste-to-energy plants. The MassDEP waste ban along with potential tax incentives for private development of energy generation from organic materials have increased interest in the development of new facilities in Massachusetts that will accept these organic materials, process them into a renewable biogas and generate electricity.

The Town is in the process of conducting final closure of their inactive unlined landfill located off Chebacco Road. The 12.7 acres that were historically landfilled are located on a 50-acre parcel owned by the Town. Much of the remaining land on the property are wetland resources and not available for development or use. The Town is moving through the MassDEP landfill closure process under the Solid Waste Management Regulations (310 CMR 19.000). The Town should be ready to start cap construction during the fall of 2012.

As part of the closure process, the Town has evaluated several development alternatives for the landfill site including commercial buildings and a wind turbine. The landfill site has many advantages including direct access from Route 128, a local zoning overlay district that encourages commercial development, and adequate wooded buffers to residential areas. As part of the effort to develop this site, the Town has retained CDM Smith Inc. (CDM Smith) to conduct this fatal flaw analysis of siting an anaerobic digestion facility at the Hamilton Landfill. This report summarizes the findings of CDM Smith's evaluation including discussions with potential vendors, a review of the impacts of existing and proposed state and local regulations, development of a preliminary site layout, an evaluation of the impacts of constructing the facility on the landfill, a preliminary analysis of the availability of organic wastes within a reasonable hauling distance to Hamilton and a preliminary financial analysis of a proposed facility.

In summary, the proposal to site and construct a source-separated organics facility that generates electricity at the Hamilton Landfill Site merits further investigation. This would include issuing the appropriate procurement documents to allow private vendors to provide the Town with proposals to permit, construct and operate the facility at the Landfill Site.

The following is a summary of CDM Smith's conclusions and recommendations.

### Conclusions

CDM Smith offers the following conclusions based on our initial evaluation of locating a source separated organic waste processing facility at the Hamilton Landfill Site:

- There are a number of private firms actively interested in developing a source separated organic waste processing facility in eastern Massachusetts, motivated by the MassDEP's stated goal of diverting more food waste from disposal facilities and state and federal incentives to

develop more renewable energy supplies. Over the past year, there are efforts to site a facility in Haverhill and an ongoing effort by the Town of Lexington to site a facility at their closed landfill. There is also a private effort to construct facilities at several farms in central and western Massachusetts.

- Based on the preliminary site layout prepared by CDM Smith, there is adequate room on the landfill portion of the property to site an anaerobic digestion facility that can accept up to 250 tons per day (tpd) of source separated organic wastes. This layout is based on an anaerobic digestion process for organic waste. There is not adequate space at the landfill site for the handling of the digestate product.
- While anaerobic digestion of food waste is well demonstrated in Europe and anaerobic digestion of sewage sludge is common in the U.S., this would be a first of its kind project not constructed on a farm in Massachusetts which presents some project risk;
- The Hamilton Landfill Site offers several advantages which make it an acceptable candidate for a source separated organic waste processing facility including sufficient land area to site the anaerobic digestion facility, direct access to Route 128, wooded buffers to residential property, and a potential nearby electricity user in the Manchester-by-the-Sea water treatment plant located across the street. The site lacks connections to the sanitary sewer that could handle the wastewater stream from the digestion process
- Due to the uniqueness of the development of a digestion facility for source-separated organics, there is a level of uncertainty as to the process and time frame for securing local and state permit approval. MassDEP has proposed draft regulations intended to provide a clear permitting pathway for digestion facilities through the MassDEP's Solid Waste Management Regulations (310 CMR 19.000) and Site Assignment of Solid Waste Facilities (310 CMR 16.00). The public comment period for these regulatory revisions has ended and MassDEP is currently reviewing the comments and determining any revisions to the draft regulations. The outcome of this process will have a significant impact on the viability of a digestion facility at the Hamilton Landfill.

In addition to the MassDEP regulations, the Town will need to revise the provisions of the Commercial Overlay Zoning District established in May 2009 to allow this type of facility. These changes include specifying this type of site use as permitted and clarifications to the requirements for stormwater and wastewater systems that are not specifically pertinent to this facility.

- Based on information available through a MassDEP organic waste study published in March 2012, CDM Smith conducted an evaluation of the available organics markets in the Hamilton area. For the communities of Hamilton, Beverly, Danvers, Essex, Ipswich, Manchester-by-the-Sea, Gloucester and Rockport, the MassDEP report estimated a total of 9,100 tons per year of commercially generated organic wastes. Extending the potential watershed to include Salem and Peabody added 6,100 more tons per year. As a comparison, a 100 tpd facility will accept 26,000 tons per year of organic waste. CDM Smith notes that the MassDEP survey had

numerous commercial businesses identified without any estimate of their annual organic waste generation rates and does not account for any materials collected from residents.

While more information on the watershed is needed, it can only be generated by commercial vendors with familiarity of the waste market in the Hamilton area. However, the Town may want to consider allowing the facility to be developed in phases while the markets are developed.

- CDM Smith conducted a preliminary financial analysis of the development of an anaerobic digestion facility at the Hamilton Landfill. The initial phase of this analysis was conducted for a 100 and 200 tpd facility (5 days per week waste acceptance operation). Because there are no baseline facilities for comparison in New England, CDM Smith made general assumptions about the costs based on current market conditions and preliminary vendor information. CDM Smith then assessed the Present Value of each alternative. The 15-year Present Value for the 100 and 200 tpd facility was approximately \$2.2 and \$12.2 million, respectively. Note that these estimates do not include the various tax incentives that would be available for a private firm developing this type of facility.

CDM Smith conducted a further analysis of the “break-even” tonnage for the proposed digestion facility using the 100 tpd scenario as a baseline. At approximately 80 tons per day of source separated organics, the facility is even financially over the 15 year term.

- Formal proposals would need to be sought to quantify the potential revenues and other in-kind services that could be available to the Town in exchange for leasing a portion of the Hamilton Landfill Site. The term of any lease would likely need to be 15 years or more to allow the vendor to recover its capital cost to develop and construct the facility.
- The Massachusetts Clean Energy Center has established a grant program for the development of organics-to-energy projects. There are grants available for up to \$60,000 with a 5% town match to assist in the development of a Request for Proposals (RFP) for commercial vendors to lease the landfill site for a digestion facility. There are also plans for further grants to assist in the design and development of this type of facility.
- Approximately 3 to 5 acres of land would be needed to support an anaerobic digestion. The areas of the site near Chebacco Road have the shallowest depths of landfilled waste and are appropriate for siting the structures associated with the digestion facility. Locating the facility at the northern portion of the site will leave a significant area potentially available for the development of a solar photovoltaic (PV) system or some other potential use.

Two areas of the landfill property are currently used by two clubs as gun practice ranges. The location of one of the operations (Miles River Rats Skeet and Trap Club) is in close proximity to the proposed digestion facility location as well as on top of a portion of the landfill that requires capping. This club will have to be relocated to accommodate both the capping and the development of the proposed site uses. The other club (Hamilton/Wenham Road and Gun Club) has an adequate distance from the proposed digestion and potential solar PV facilities to be

allowed to continue to operate. However, the access to this Club's location off Chebacco Road will have to be coordinated with the digestion facility.

### **Recommendations**

CDM Smith offers the following recommendations for the Town's consideration should they decide to continue to pursue development of a digestion facility at the Landfill Site:

- Because they have access to commercial waste generators and can take advantage of various existing tax incentives for energy generation, CDM Smith recommends that the Town partner with a private firm to develop a digestion facility at the Hamilton Landfill. Under Massachusetts procurement laws, this will require the preparation of an RFP to be issued to private vendors. The RFP will include specific information on the site and the required permit approvals as well as detailed minimum qualifications on the proposed technology and the financial viability of the proposer. The RFP should also include a draft land lease agreement that contain specific requirements and conditions that the Town desires.
- The permitting process both locally and with MassDEP needs to be finalized so that potential developers have a clear understanding of the upfront effort that will be needed. MassDEP is currently working through the comments on their draft regulations. If they wish to move ahead, the Town should try to be ready to procure a developer concurrent with the revised regulations being finalized.
- The Town is currently finalizing the requirements for closure of the Hamilton Landfill in accordance with MassDEP regulations. The incorporation of a future digestion facility, along with the other potential post-closure uses, needs to be incorporated into the closure design.
- The Town should prepare an application for grant funding under the MassCEC organics to energy program. This grant could include funding for the development of an RFP and/or other efforts related to the development of a facility.

# Section 1

## Introduction and Project Overview

### 1.1 Introduction

The Town of Hamilton, Massachusetts (Town) owns an approximate 50-acre parcel situated off Chebacco Road located on the town line with the Towns of Essex and Manchester-by-the-Sea. Approximately 12.7 acres of this property was previously used as the Town's landfill. The remainder of the site is either wetlands or approximately 10 additional acres of potentially developable upland areas.

The landfill ceased operating in the early 1980's and the Town installed a cap over approximately 7.1 acres. Since being closed, the landfill site has not been intensively active and is currently used for limited public works related stockpiling operations and two gun clubs.

Over the past two years, the Town has undertaken a curbside collection program of residential source separated organic materials. The program collects an average of 3.2 tons per day of organic waste that is incorporated into the leaf and yard waste composting operation at Brick End Farm in Ipswich. Over the last few years, the Town has also undertaken a separate effort to develop the landfill site for commercial uses. The combination of these efforts has generated an interest in the Town in exploring the possibility of developing a source-separated digester facility on a portion of the Hamilton Landfill Site.

The development of facilities that accept source separated organics and generate electricity and a re-usable organic residual known as "digestate" is one of the key goals of the 2010-2020 Massachusetts Solid Waste Master Plan issued by the Massachusetts Department of Environmental Protection (MassDEP). MassDEP is currently working towards the implementation of a clear permitting pathway for digestion facilities as well as a ban from transfer, contracting for disposal or disposal of commercially generated source separated organic wastes in landfills and waste-to-energy plants. MassDEP intends to implement this waste ban in either 2013 or 2014. These efforts have generated a significant interest from various vendors and solid waste firms in developing these types of facilities in Massachusetts.

CDM Smith Inc. (CDM Smith) has been retained by the Town to conduct a fatal flaw analysis of the development of an anaerobic digestion facility on the 50-acre landfill site. The fatal flaw analysis includes assessing the suitability of the landfill site for the intended purpose, gathering information from potential developers that would be used to help define the project specifics, reviewing local and state regulations to determine the permitting requirements and conducting a preliminary review of financial plans for the facility. This report includes the results of CDM Smith's evaluation of the existence of any "fatal flaws" that would limit the Town's ability to develop an anaerobic digestion facility at the landfill site. CDM Smith will also provide an outlined of next steps needed to proceed should the Town elect to move forward with this project.



## 1.2 Description of Potential Anaerobic Digestion Facilities

The anaerobic digestion facility that is being considered construction and operation of a source separated organic waste processing facility that would generate a renewable biofuel and digestate. This section will briefly outline the types and sources of organic wastes that could be accepted, the general technologies to be considered and the quantity of organic materials that will make the proposed facility financially viable.

### 1.2.1 Potential Organic Waste Streams

The targeted waste materials for the anaerobic digestion project will include only organic waste that is separated at the point of generation (source separated) and not mixed with other waste materials. Depending on the processing technology employed, source separated organic waste could include one or more of the items defined below. Other source separated materials that may be appropriate for this type of facility depending on the type of technology used include fats, oils and greases (so called FOG material) and sludges from municipal wastewater treatment facilities.

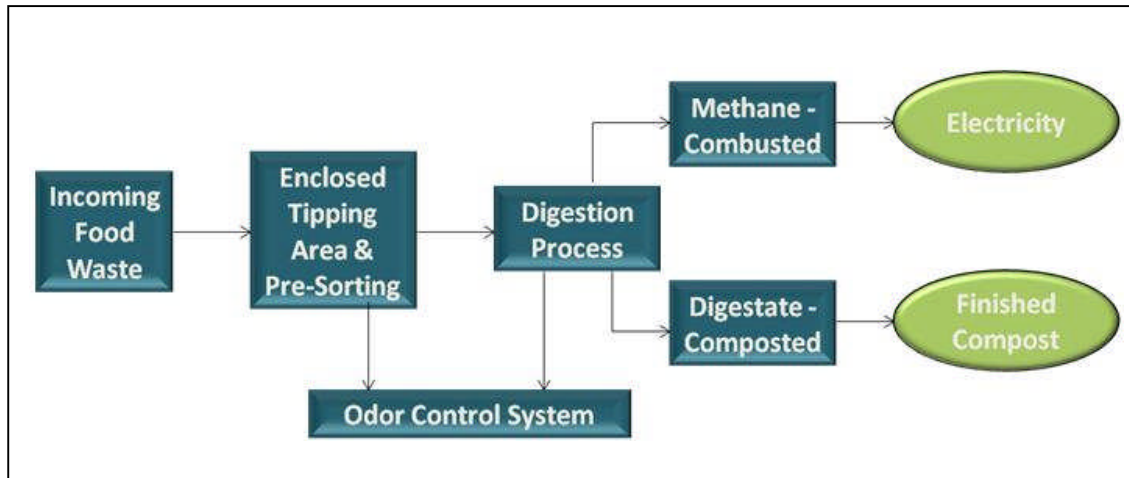
The source of the organic waste materials will initially be primarily from commercial sources including institutions such as hospitals, colleges and universities, schools, correction facilities, supermarkets and food processors. In the future, the organic materials may also be from residential curbside collection such as the ongoing program in Hamilton.

The MassDEP definitions for the various organic waste materials are provided below:

- **Food Material** – Source separated material produced from human food preparation and consumption activities at homes, restaurants, cafeterias, or dining halls which consists of fruits, vegetables and grains, fish and animal by-products, and soiled paper unsuitable for recycling.
- **Yard Waste** – Deciduous and coniferous seasonal deposition (e.g., leaves), grass clippings, weeds, hedge trimmings, garden materials and brush.
- **Agricultural Waste** – Discarded organic materials produced from the raising of plants and animals as part of agronomic, horticultural or silvicultural operations, including but not limited to, animal manure, bedding materials, plant stalks, leaves, other vegetative matter and discarded by-products from the on-farm processing of fruits and vegetables.
- **Vegetative Material** – Discarded source separated material which consists solely of vegetative waste such as fruits, vegetables and grains, which is produced from food preparation activities at, but not limited to, grocery stores, fruit or vegetable canning, freezing or preserving operations, and food or beverage processing establishments.

### 1.2.2 Potential Processing Technologies

A schematic diagram showing the general process that will be utilized to accept source-separated organic waste streams and process them into a biogas that can either be imported directly into a natural gas distribution system or converted into electricity is shown schematically on Figure 1-1.

**Figure 1-1 - Schematic Flow Chart of Anaerobic Digestion Facility with Electrical Generation**

There are numerous proprietary technologies that CDM Smith has previously investigated for these types of facilities. These include wet and dry type proprietary systems. CDM Smith notes that the MassDEP is developing very specific criterion of what technologies will be allowed to obtain permits and several similar technologies including the generation of a biogas in a pyrolysis process will not be viable to be permitted in Massachusetts. The current status of these permits is provided in Section 2.

The available areas for development of the facility on the site as discussed in Section 3 of this report will accommodate only the anaerobic digestion facility, not any composting or active processing of the residual materials or digestate. This will likely limit the ability to accept significant quantities of either yard or agricultural wastes. A significant portion of the future plan for this facility will be the development of a plan to handle the residuals or digestate from the anaerobic digestion process. A portion of this digestate can be an organic slurry that is difficult to dispose of within a municipal wastewater treatment system but has been utilized for both an additive to leaf and yard waste windrow composting and farm animal bedding. The digestate may also be dried into pellets that can be land-applied as a fertilizer.

In developing the final plan for the facility, the Town needs to consider the specific types of materials will be acceptable including the quantity of materials to be allowed.

### 1.2.3 Example Facilities

There are a very limited number of facilities in the United States that accept source separated organic wastes including food materials into anaerobic digesters. The existing facilities are located on farms and rely on agricultural materials for a significant portion of their input waste stream. There are numerous example facilities in Europe and several under development and start-up in Canada. In addition, the anaerobic digestion technology has been implemented at numerous municipal wastewater treatment plants including the Deer Island facility operated by the Massachusetts Water Resources Authority.

The only existing digestion facility in Massachusetts currently operating is operated by AGreen Company at a dairy farm in Rutland. This facility takes manure from the farm (and other farm sites),

combines it with approximately two truckloads of food waste from food processors and generates electricity. The facility has been operating for approximately one year and reportedly cost between \$2.5 and \$3.5 million to construct. CDM Smith notes that the construction of this facility had significant grants and incentives from various governmental agricultural and energy agencies. The developer of the Rutland facility intends to construct other similar facilities in central and western Massachusetts.

## Section 2

# General Facility and Regulatory Permitting Requirements

## 2.1 Introduction

In preparing this report, CDM Smith discussed the proposed project with several potential developers and regulatory agencies. The following section is a summary of these discussions and the identification of the appropriate approach as well as any potential significant issues with the development of a digestion facility at the landfill site.

Over the past several months, MassDEP has undertaken a significant process to modify their Solid Waste Management Regulations (310 CMR 19.000) and the associated Site Assignment Regulations for Solid Waste Facilities (310 CMR 16.00) to accommodate the ability to permit digestion facilities that will accept source separated organic wastes. This process is ongoing and is intended to allow for the development of the necessary infrastructure statewide to ban the disposal of commercially generated source separated organic wastes from disposal in landfills and waste-to-energy plants in either 2013 or 2014.

The development of digestion facilities in Massachusetts is a significant statewide initiative. In addition to increasing the amount of waste diverted from disposal in landfills and waste-to-energy plants, the generation of a renewable source of electricity fulfills the goals of many of the Commonwealth's programs. The Town is currently funding this report through a Sustainable Materials Recycling Program (SMRP) grant from the MassDEP. There are also future grants currently available from the Massachusetts Clean Energy Center (MassCEC) under their "Organics to Energy" program. Currently, MassCEC can provide up to \$60,000 to assist communities with studies and reports, including the preparation of a Request for Proposals (RFP) to allow a portion of the landfill to be leased to a private entity. The MassCEC is developing other grants that will assist with the development of these projects.

## 2.2 Anticipated Facility Size and Constraints

While preparing this report, CDM Smith discussed the potential digestion project with several developers and vendors interested in this type of facility. While the vendors will have to perform a site specific plan before providing a detailed proposal, the following general comments were provided that will assist the Town in evaluating the viability of the project:

- The vendors require flexibility in the allowable tonnage of materials that could be delivered to the facility. Their initial estimate of the minimum tonnage needed to be financially viable is 100 tons per day of source separated organics with a maximum of 250 tons per day.
- All of the vendors felt that a facility in Hamilton could be financially viable and that there was an adequate source of appropriate organic wastes within a reasonable haul distances. To CDM

Smith's knowledge, no other digestion facility is actively being proposed within the watershed of the proposed Hamilton facility.

- CDM Smith generally described the location and its benefits. The benefits of this location include its direct access from Route 128 without passing any residential homes. There was some questions about the ability to construct the facility on top of the old landfill that will have to be addressed and the status of the site assignment.
- While MassDEP is evaluating banning the disposal of this waste stream, it is unclear the quantity of source separated organics that will be available in the short-term. Therefore, the vendors requested that the Town provide flexibility in the development timelines to allow for an extended start-up period until an adequate supply of materials become available.
- One of the vendors is actively pursuing locations to transfer smaller quantities of organic wastes into larger vehicles for ultimate processing at another location. This operation may also work as a short-term approach until the markets are fully developed as discussed above.
- As detailed below, the regulatory permitting process for this type of facilities is still being finalized by MassDEP. There are also other issues related to the status of the site assignment of the landfill site that will need to be clearly defined prior to the development of the site.
- The location of a potential user of electricity at the Manchester Water Treatment Plant provides an opportunity for the direct use of a portion of the electricity generated by the digester. A significant potential cost is the interconnection of the electricity from the digester facility into the local utility. This cost needs to be ironed out prior to the development of the facility on-site.
- The disposal of the digestate from the process is a significant consideration in the development of a facility. A long-term nearby partner will have to be identified by the vendor to insure cost-effective and reliable disposal.

The technologies for the digestion of organic waste streams such as those anticipated at the proposed Hamilton facility are proprietary and are licensed to specific vendor(s) in the United States. Also, these vendors are typically teamed with a waste hauling company that provide the customer base, facilities and equipment to collect the quantity of organic materials required for the operation to be financially viable. These private firms can also take advantage of the significant tax incentives that are available for renewable energy projects over the next few years. These incentives make this type of project financially attractive and provide significant offsets of the upfront capital costs.

For these reasons while a facility like this could be designed and operated by the Town, CDM Smith believes that the best approach is to develop a RFP under the appropriate Massachusetts procurement law to lease a portion of the site to a private vendor for the development of this type of facility.

## 2.3 Current Regulatory Requirements

The development of any organic waste facility will require a significant permitting process with various state and local agencies. Many of these permits will require detailed technical information on the

facility and can only be prepared when the final design has been completed. However, some other permits and approvals may be better obtained or clarified by the Town as the next steps in the development process.

Many of the specific state requirements for permitting a source separated organic waste processing facility are under development. This section will provide a summary of the current regulations including the proposed draft revisions issued by MassDEP in October 2010. These revised regulations are the outcome of a Task Force for “Building Organics Capacity in Massachusetts” implemented by MassDEP.

### 2.3.1 Review of Pertinent State Regulations and Policies

#### 2.3.1.1 MassDEP Solid Waste Master Plan

Since 1990, the MassDEP has periodically issued a series of Solid Waste Master Plans that outline the priorities of the Commonwealth as they relate to the handling, recycling and disposal of solid waste. The most recent Master Plan was issued in draft form in July 2010<sup>1</sup> and included the following existing and new policy statements that are pertinent to the development of the proposed facility in Hamilton:

- Dramatically increase recycling and re-use of solid waste;
- Maintain moratorium on additional municipal solid waste combustion (i.e., waste-to-energy) capacity.
- “Modify MassDEP’s siting regulations to eliminate barriers to siting facilities that support increased recycling and composting, as well as other facilities such as anaerobic digestion facilities that generate energy from source separated organic materials. Maintain strict facility oversight to ensure a high level of environmental performance.”
- The solid waste regulations include a variety of wastes that are banned from disposal in waste-to-energy plants and landfills. MassDEP has developed protocols for both facilities that handle waste such as transfer stations and disposal facilities to conduct regular inspections of the incoming waste stream and reject loads that have a high percentage of any banned materials. Some of the banned materials in-place currently including paper, glass, tires, leaf and yard waste, “white goods” (appliances) and plastics. In the Draft Master Plan, MassDEP proposes to increase the enforcement of “waste bans” at landfills and in the commercial waste stream including adding organics to the list of banned materials and working to develop alternative markets and facilities. The addition of organics to the list of banned materials assumes that adequate market capacity exists to handle the diverted materials.

The MassDEP received comments on the draft Master Plan during the summer and fall of 2010 and is proposing to finalize the latest version of the Master Plan. While the final version has not been issued, the MassDEP has begun to implement some of the recommendations. The goals are directly in-line with the development of a facility that accepts source-separated organic materials. CDM Smith does not anticipate any significant change to this portion of the Master Plan. In fact, the recent proposed

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<sup>1</sup> “Draft 2010-2020 Massachusetts Solid Waste Master Plan, Pathway to Zero Waste,” MassDEP, July 1, 2010.

revisions to MassDEP's solid waste regulations discussed below are intended to implement the goals outlined in the Draft Master Plan.

### **2.3.1.2 Site Assignment Regulations for Solid Waste Facilities (310 CMR 16.00) Including Proposed Modifications**

The MassDEP's current site assignment regulations outline the process for deciding whether a specific parcel of land is suitable to be used for a solid waste management facility. Site assignments have historically been required for landfills, waste-to-energy facilities, transfer stations and waste processing facilities. They outline several specific exemptions for certain recycling, public works, and composting operations. The regulations include a set of specific siting criteria including prohibitions of siting facilities in wetlands or on conservation land; setbacks from sensitive receptors such as residences and schools; and requirements to evaluate impacts such as traffic, odors and noise.

A version of the site assignment regulations have been in place since 1955. It is likely that the Hamilton Board of Health issued a site assignment for the Chebacco Road Landfill since it operated from the late 1950's until 1983; however, a copy of the site assignment cannot be located.

These regulations also outline a specific process for obtaining a new site assignment that includes a public hearing process overseen by the local Board of Health. The current site assignment regulations did not anticipate the permitting of a facility that will accept source separated organic materials and produce electricity. Therefore, facilities proposing technologies such as anaerobic digestion did not have a clear permitting pathway for receiving MassDEP and local Board of Health approvals.

In response to this problem, the MassDEP implemented a task force to develop revisions to the site assignment regulations that would provide a clear permitting pathway for facilities that accept source separated organics facilities. In October 2011, the MassDEP issued draft modifications to the current site assignment regulations intended to build capacity in Massachusetts to recycle source separated organics waste. The public comment period for these regulations closed on January 23, 2012. Following review of the comments, MassDEP will either issue final regulations or issue another draft version for further public comment. CDM Smith understands that the MassDEP received a significant number of varied comments on the draft regulations and that the final implementation of the new approach will take several months.

Under the proposed revisions to the site assignment regulations, MassDEP has included several exemptions for various recycling and municipal operations (including establishment of an exemption from permitting for a "municipal food collection facility"). The most significant change that is relevant to the development of a source separated organics facilities is the establishment of a permitting process to allow these facilities without the need for a site assignment. There are two levels of facilities that would be exempt under the proposed revisions that may be appropriate for the Hamilton Landfill:

- Aerobic or Anaerobic Digestion facilities that accept up to 60 tons/day of source-separated organic material that is pumped directly into the digester unit or a tight storage tank. These facilities would be allowed under a "Permit by Rule" process whereby if a proposed facility met certain minimum criteria as well as operating using "Best Management Practices" including

operator training, appropriate process and environmental controls, appropriate handling of odorous putrescible wastes, recordkeeping, and an odor contingency plan). As long as the operator meets the requirements of the Permit by Rule and does not create any nuisance conditions, the facility can continue to operate.

CDM Smith notes that while the 60 tons per day maximum capacity allowed under the Permit by Rule provisions may be commercially viable at the Chebacco Road Landfill, there are other specific Best Management Practices such as the receipt of organic materials being pumped directly into a storage tank or the digester unit that may be limiting. If this provision continues to be allowed, it will significantly limit the types of technologies that could be implemented as well as the available customers (e.g. this approach may not be appropriate for curbside collected materials that likely require pre-processing prior to introduction into the digester unit).

- Aerobic or Anaerobic Digestion facilities or other “conversion” technologies that accept greater than 60 tons/day of source separated organic (compostable) materials. These facilities would be required to obtain a site-specific permit from MassDEP. The proposed regulations outline the general requirements for the permit application as well as the long-term operations. CDM Smith does not see any significant issues with the proposed requirements on the development of this type of facility on the landfill.

The proposed regulations provide for the permitting process that includes development of a draft permit by MassDEP, a public comment process and ability for a public hearing and administrative appeals. This process is very similar to those for other solid waste facilities being developed on land that has already been site assigned.

CDM Smith notes that the Solid Waste Master Plan has a moratorium on the construction of new municipal solid waste combustion capacity (e.g. waste-to-energy plants). There has been significant discussion on the applicability of the moratorium on various innovative solid waste conversion technologies over the past several years. If the Town plans on evaluating an alternative technology other than aerobic or anaerobic digestion, there will have to be a significant discussion with MassDEP policy makers on the applicability of the moratorium to the specific technology.

The proposed revisions to the Site Assignment regulations allow for the development of these types of facilities on previously site assigned properties provided that the existing site assignment does not preclude this type of project. Given the age of the Chebacco Road Landfill, if a site assignment was issued by the Hamilton Board of Health it did not specifically provide for this type of facility or it could have other typical limitations such as only allowing waste from Hamilton. If any similar limitations exist, there would be a requirement to modify the old site assignment, a process that includes a submittal to MassDEP to determine the appropriate criteria that would require further evaluation, a public hearing process with the Board of Health, and issuance of a final revised site assignment. This process may also include the involvement of the Essex and Manchester-by-the-Sea Boards of Health given the proximity of the town lines to the site.



The Site Assignment regulations will likely be the most significant permitting process undertaken to construct a source separated organics facility at the Hamilton Landfill. CDM Smith recommends that there be preliminary discussions with both MassDEP and the Board of Health to confirm in writing that the site assignment either does not exist or cannot be located and possibly to solicit their input on the proposed development of this type of facility at the site.

### **2.3.1.3 Solid Waste Management Regulations (310 CMR 19.000) and Proposed Revisions**

The solid waste regulations were promulgated to protect public health, safety and the environment from facilities that handle, process and dispose of solid waste. Solid waste is currently defined as:

*“Solid Waste or Waste means useless, unwanted or discarded solid, liquid or contained gaseous material resulting from industrial, commercial, mining, agricultural, municipal or household activities that is abandoned by being disposed or incinerated or is stored, treated or transferred pending such disposal, incineration or other treatment, but does not include.....;*

*(i) compostable or recyclable materials when composted or recycled in an operation not required to be assigned pursuant to 310 CMR 16.05(2) through (5).*

Typically, once a site has been “assigned” by the local Board of Health under the Site Assignment Regulations discussed above, the specific facility (e.g. landfill, transfer station or waste-to-energy plant) will require a site-specific permit under the Solid Waste Management Regulations. There is no clear permitting pathway under the current Solid Waste Management Regulations that allows the type of source separated organics digestion facilities contemplated for the Hamilton Landfill site.

The definition of “recycle” in the solid waste regulations is the same as contained in the current site assignment regulations and includes an exclusion on the use of recyclable materials for the generation of electricity.

Similar to the site assignment regulations discussed above, MassDEP has proposed revisions to the Solid Waste Management Regulations including the clear permitting pathway for permitting various organics facilities as discussed above. These revisions were issued for public comment concurrent with the Site Assignment revisions and will likely be issued either for further public comment or final at the same time. The Town should continue to monitor the status of these regulatory changes and their potential impacts on the development of a facility at the landfill site.

### **2.3.1.4 Solid Waste Management Regulations – Landfill Closure and Post-Closure Use Requirements**

The Solid Waste Management Regulations also outline the requirements for the capping and closure of older unlined solid waste landfills such as the Chebacco Road site. MassDEP also has requirements to permit any post-closure use of old landfill sites and requires a specific use permit for any use including recreational fields, solar photovoltaic systems, and buildings. The post-closure use must be shown to be protective of human health, safety and the environment and not adversely impact the final cap. For construction of buildings such as those required for a digester type facility, there will be requirements to demonstrate that adequate foundations can be installed and that landfill gas can be controlled. Both of these issues can likely be addressed at the Hamilton Landfill site.

The status of the final cap over the Chebacco Road Landfill is part of ongoing discussions with MassDEP regulators. Approximately 7.1 acres of the 12 acres that were historically landfilled had at least portions of a final cap constructed in the early 1980's. The remaining areas will require a cap that meets MassDEP's current regulatory standards or an approved alternative. The decision about how to approach a final cap for the site will be dependent on the selected post-closure use. Further discussion needs to take place with both the Town and MassDEP to determine the appropriate final cap to allow flexibility for various post-closure uses and minimize overall costs to the Town.

### **2.3.1.5 Massachusetts Environmental Policy Act Regulations (310 CMR 11.00)**

The MEPA regulations are pertinent to proposed projects that exceed certain prescribed thresholds that could potentially impact human health, safety and the environment. The thresholds cover numerous topics including impacts to wetlands, capacity of solid waste facilities, air quality emissions, amount of impervious area, endangered species, conservation land, water and wastewater systems, transportation and traffic, energy generation, and historic and archaeological resources.

For projects that exceed one or more of the thresholds, the MEPA regulations require the project proponent to study the impacts and propose mitigation measures. These evaluations are typically completed as part of an Environmental Notification Form (ENF) submitted to the MEPA office. The ENF is publically advertised and distributed to various state and local agencies for review and comment. The MEPA office then makes a determination if the project requires further review as part of an Environmental Impact Report (EIR) or if no further action is needed. Projects that exceed another set of thresholds are automatically mandated to submit an EIR. For projects required to submit an EIR, several draft submittals may be required prior to the MEPA office issuing a certificate that no further action is required.

No state agency such as MassDEP can issue any permits for a project until the MEPA office has completed their process. For projects that require an EIR, the process can take a year or more to complete and entail significant costs. The requirement of an EIR for the proposed facility would be a risk and a burden to the developers and would likely significantly decrease the value of the project to the Town.

Of the current MEPA thresholds, the most likely to impact the proposed source separated organic waste processing facility is contained in 301 CMR 11.03(9) and reads as follows:

*“(9) Solid and Hazardous Waste.*

*(a) ENF and Mandatory EIR. New Capacity or Expansion in Capacity of 150 or more tpd for storage, treatment, processing, combustion or disposal of solid waste, unless the Project is a transfer station, is an Expansion of an existing facility within a validly site assigned area for the proposed use, or is exempt from site assignment requirements.*

*(b) ENF and Other MEPA Review if the Secretary So Requires.*

- 1. New Capacity or Expansion in Capacity for combustion or disposal of any quantity of solid waste, or storage, treatment or processing of 50 or more tpd*

*of solid waste, unless the Project is exempt from site assignment requirements...”*

Based on the current language, a facility accepting more than 150 tons/day would require a mandatory EIR unless the source separated organic materials are not considered “solid waste” or the proposed use is exempt from the site assignment requirements.

In addition to the solid waste thresholds, there are other criteria that might impact the proposed facility. Based on the projects that could potentially be approved by MassDEP and our knowledge of the landfill site, we do not believe that any of the other thresholds will require filing with MEPA. However, there are specific air emission thresholds that will need to be evaluated during the proposal process. MEPA has also established a greenhouse gas policy to evaluate emissions from new facilities that may have an impact on the requirements for the organic waste processing facility. As this policy is relatively new, it is not possible at this time to gauge the potential impacts on the proposed facility.

CDM Smith understands that MassDEP has started discussions about revisions to the MEPA regulations and thresholds to match those proposed in the draft Site Assignment and Solid Waste Management regulations discussed above. Since the preparation of an EIR is a significant expense as well as requiring significant time, the Town should monitor the status of these proposed revisions to the MEPA regulations and their specific impacts on the types of facilities to be constructed in Hamilton.

#### **2.3.1.6 Other State Permitting Requirements**

In addition to the solid waste related permits outlined above, the proposed facility may be required to obtain a Non-Major Comprehensive Plan Approval under the MassDEP’s Air Quality Regulations (310 CMR 7.000) if the facility includes a point-source stack emission. The digestion processes that include generating electricity will be required to obtain a permit under these regulations. Because the filing of this permit requires specific information on the emissions and engineering controls of the specific technology, this permit is best obtained by the selected vendor.

## **2.4 Local Permitting Requirements**

In addition to the state overseen regulatory processes outlined above, there are two local permitting processes that will have to be addressed. The first local permitting process is the receipt of an Order of Conditions from the Hamilton Conservation Commission. This approval will include specific provisions related to the impacts of the facility on wetlands, construction related mitigation and stormwater controls. The filing with the Conservation Commission will be required because of the proximity of the available areas on the site to wetland resource areas.

In May 2009, the landfill site was established as a Commercial Overlay Zoning District by the Town. The zoning regulations associated with this District are intended to allow for land uses that will support economic development and to provide a clear permit review and approval pathway for proposed projects. Based on CDM Smith’s review of these regulations, the development of an anaerobic digestion facility (or similar operations) is not a specifically permitted use. There are also specific requirements related to the completion of a traffic study, limitations on storage of wastewater sludges and design standards to provide the equivalent groundwater recharge for

impervious areas greater than 2,500 ft<sup>2</sup> that will be problematic in the vicinity of an unlined landfill. Should the town elect to move ahead with this facility, there should be a detailed review of these regulations with the local Planning and Zoning Boards and necessary revisions or clarifications made.

## Section 3

# Site Analysis

### 3.1 Analysis of Available Site Development Locations

For this fatal flaw analysis, CDM Smith considered the location of an anaerobic digestion facility on the approximately 50-acre parcel previously proposed for development by the Town in the document entitled "Request for Proposal Offering Package for Development of 50+- Acre Site" dated March 8, 2010 (Development RFP). As part of the RFP process and the Comprehensive Site Assessment (CSA) prepared by SEA Consultants, the wetland resource areas were delineated by Hancock Associates, Inc. (Hancock) for most of the entire site. The 50 acre site includes the existing landfilled areas and the two gun clubs on-site. The Development RFP reported approximately 10 acres of developable land on-site, not including the historically landfilled areas and the delineated wetland resource areas.

CDM Smith reviewed the wetland delineation plan prepared by Hancock Associates as well as completed an updated delineation of wetland resource areas around the areas that were historically landfilled as part of the ongoing landfill closure project. Because of the requirements of state and federal wetland protection laws and regulations, developing an anaerobic digestion facility that will permanently impact significant wetland resource areas either for building construction or access roads is not viable and will be the primary limitations on the selection of an on-site location.

The wetland delineation work conducted by both CDM Smith and Hancock, along with a review of regional mapping available through MassDEP and others found that there are three significant upland areas on the landfill site with the adequate contiguous area to site an anaerobic digestion facility (e.g. between 2 to 5 acres). These areas are the top of the former landfill including some unfilled abutting areas, a mound located along the eastern property line and the archery and shooting range currently operated by the Hamilton/Wenham Rod and Gun Club. A copy of the Hancock Associates map showing these areas is included in the appendices.

In conducting this fatal flaw analysis, CDM Smith evaluated the following preliminary evaluation of each of these areas and recommends that, should the Town elect to pursue the anaerobic digestion facility further, the facility be sited on the former landfill. CDM Smith notes that given the separate components of a digestion facility, it may be possible to locate portions of the facility on different areas of the site.

#### 3.1.1 Evaluation of Hill along Eastern Property Line

The mound area located to the east of the property is surrounded by wetland resource areas and would require a significant crossing road to access. From the available topographic survey, it is also has steep slopes and is mapped as a large bedrock outcrop in the CSA. For these reasons, this location is not a viable for the development of the anaerobic digestion facility.

### 3.1.2 Evaluation of Hamilton/Wenham Rod and Gun Club Location

The upland areas around the Hamilton/Wenham Rod and Gun Club area are located within an approximate 100 to 150-foot wide strip of land approximately 550 feet in length that is bounded on one side by the site property line and on the other by an intermittent stream and man-made pond. The area is flat and has an existing access road through the landfill from Chebacco Road.

To facilitate development of the landfill site, the Town established a Commercial Overlay Zoning District as discussed in the section on permitting. The Overlay District includes the landfill site and extends from the Town lines with Essex and Manchester-by-the-Sea to Chebacco Road and to the northern property line immediately beyond the Hamilton-Wenham Rod and Gun Club. The Town's zoning code requires a 25-foot buffer for buildings from the perimeter of the mapped Overlay District. This buffer would only impact the potential location at the Hamilton-Wenham Rod and Gun Club and, because of the wetland resource areas located between the property line and the Rod and Gun Club property, will not be a significant restriction on the development of this location.

The Rod and Gun Club site is surrounded by wetland resource areas on all sides. The location of the intermittent stream along the southern edge of the Club operations will likely require establishment of a buffer area with limited ability to construct permanent improvements such as access roads. While the area adjacent to the stream is already in use for the Gun Club, a redevelopment use will require compliance with wetland protection regulations. CDM Smith notes that while these requirements are enforced locally by the Hamilton Conservation Commission, they are based on state laws and regulations overseen by the MassDEP.

The construction of an anaerobic digestion facility at this location will require the regrading and relocation of the existing subsurface soils and berms currently located on the property. While the CSA completed by SEA conducted limited environmental sampling in this area did not find significant contamination related to its current use, the relocation of materials and possible requirements for its off-site disposal will require additional sampling and analysis. The procedures for handling these soils would have to be clearly defined in any procurement document issued by the Town for the development of this area.

Finally, while the exact limits of the Rod and Gun Club site have not been precisely delineated, the total available area of approximately 2 acres is less than would ideally be required for the development of an anaerobic digestion facility. Given the requirements for a buffer zone on one side required by the Zoning Overlay District, the likely buffers that will be required from the wetland resource areas on the other side, and the requirements for significant areas to be utilized for access roads and stormwater controls, the available area at this location will be extremely tight.

Based on this evaluation, CDM Smith does not recommend that the Town pursue the development of the Hamilton/Wenham Rod and Gun Club location for the entire anaerobic digestion facility.

### 3.1.3 Evaluation of Landfill Portion of Location

The landfill portion of the site provides an adequate land area of approximately 12.7 acres of historically landfilled upland areas with several surrounding upland areas. The location is bordered by Chebacco Road to the west and the delineated wetland resource areas on all other sides. Topography

at the site includes steeper slopes around the site perimeter and there is a direct site access road to Chebacco Road.

As part of a separate task being performed by CDM Smith, the Town is evaluating the adequacy of the historic cap constructed in the early 1980's over approximately 7.1 acres of the 12.7 acre landfill. The remaining area of the landfill requires a new cap of a type to be approved by MassDEP. CDM Smith is assisting the Town in determining whether the 7.1 acres of previously capped areas require any additional cap layers to meet MassDEP regulatory standards. Initial investigations conducted by SEA and CDM Smith of the existing cap found that it did not entirely comply with the plans previously approved by MassDEP and may require augmentation and improvement.

The construction of an anaerobic digestion facility on top of any portion of the landfill will require significant revisions to the both the existing and future final cap at the site and require a Major Post-Closure Use permit be obtained from MassDEP under their Solid Waste Management Regulations (310 CMR 19.000). CDM Smith is incorporating the potential development of a digestion facility on a portion of the landfill, along with other potential uses, into a Corrective Actions Alternative Analysis (CAAA) that will be submitted to MassDEP for review and approval during the spring of 2012. The development of the digestion facility on the landfill, including the areas that were historically capped, needs to be discussed further with MassDEP to insure that the cost of implementing any cap requirements does not exceed the value of the digester project to the Town. It is likely that the development of buildings on landfilled areas will require the Town to demonstrate an adequate foundation as discussed below as well as incorporate appropriate protections to the existing and new cap and allow for venting of any landfill gases still generated by the waste.

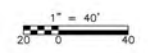
The most significant limitation associated with the construction of the buildings associated with the anaerobic digestion facility on top of a historic landfill is the foundation requirements. It is likely that the solid waste placed in the landfill is unconsolidated and will require a more significant independent foundation system such as piles or soil piers. These foundation systems will most likely be required to tie into the underlying bedrock at the site that, according to the CSA, is between 10 and 30 feet below the existing top of landfill elevations. CDM Smith also notes that several areas of the landfill, including the area currently used by the Marsh River Rats Skeet and Trap Club has very shallow areas of landfilled waste that could potentially be excavated and relocated to another area to establish improved subsurface conditions. There is also a significant adjacent area that has not landfilled waste with the potential for incorporation into this development. In addition to the need for enhanced building foundations, the design of the facility will have to include measures to pre-load the paved areas outside the structures to minimize differential settlement. The placement of the facility on top of the landfill will require a further geotechnical engineering evaluation to provide adequate information about the foundation needs and requirements.

While the landfill site is not ideal for the development of the types of structures and facilities associated with an anaerobic digestion operation, it is the preferred location on the current site. If the Town elects to pursue this location further, CDM Smith recommends the completion of a geotechnical analysis of the proposed location as well as completing the CAAA process with MassDEP to define the final cap requirements. CDM Smith has prepared the attached figure 3-1 showing the approximate

location of the various components of the anaerobic digester facility on the front of the landfill site adjacent to Chebacco Road.



- LANDFILL PROPERTY LINE
- - - - - APPROX. LIMIT OF WASTE
- STREAM
- 70 MAJOR CONTOUR (ELEVATION IN FT)
- MINOR CONTOUR (ELEVATION IN FT)
- MW-1 HAMILTON LANDFILL MONITORING WELL
- MW-55 MANCHESTER LANDFILL MONITORING WELL



REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: L. BUSAY  
 DRAWN BY: X  
 SHEET CHK'D BY: X  
 CROSS CHK'D BY: X  
 APPROVED BY: X  
 DATE: APRIL 2012



TOWN OF HAMILTON, MASSACHUSETTS  
 FATAL FLAW ANALYSIS - ANAEROBIC DIGESTION FACILITY

CONCEPTUAL LAYOUT-  
 ANAEROBIC DIGESTER

PROJECT NO. 0644-89096  
 FILE NAME:  
 SHEET NO.  
**FIG. 3-1**

## Section 4

# Project Cost Considerations

### 4.1 Introduction

As part of the effort to evaluate the potential for the development of an anaerobic digester facility at the Hamilton Landfill, CDM Smith undertook an effort to evaluate and compare the costs to permit, construct and design the facility; operate it by accepting source separated organic wastes for a disposal tipping fee; generate electricity for sale back into the grid; and dispose of the digestate residual off-site. The intent of this analysis was to assess whether a facility could be financially viable at the site. CDM Smith also conducted a preliminary analysis of available organic waste sources near Hamilton.

CDM Smith’s approach to the economic analysis was to utilize Present Value Analysis to compare the value of two alternatives – a facility that receives 100 and 200 tons per day (5 day per week operation for receipt and 52 weeks per year). Based on these results, a third alternative was added to determine the daily tonnage that would be financially a “break-even.” Present Value Analysis uses a normalizing interest rate to compare the value of future costs and revenues and place them into dollars today. For this analysis, CDM Smith assumed that the facility would start operating in 2015 and that the capital costs would be amortized over 15 years. Future operating costs such as labor and operation and maintenance as well as revenues from tipping fees and electricity would be increased annually by an assumed constant Consumer Price Index (CPI). CDM Smith also assumed that the host community would be paid a per ton fee for the operation of the facility. The economic factors were held constant for all scenarios are summarized on Table 4-1.

Many of these facilities are privately operated and are able to take advantage of a variety of existing tax incentives that are not available to a municipal operation. These incentives are based on the business structure of the private entity and are not included in this analysis.

**Table 4-1  
General Economic Assumptions Incorporated into Comparative Financial Analysis**

Financial Assumption	Assumed Factor
Normalizing Discount Rate for Present Value Calculation	4.7%
Assumed Borrowing Interest Rate for Capital Purchases	5.0%
Assumed Consumer Price Index (CPI)	3%
Period for Loan Payback on Capital Purchase	15 years
Per Ton Assumed Host Community Fee	\$3 per ton

### 4.2 Summary of Operations Cost Assumptions

In addition to the daily tonnage that can be accepted at the facility, many of the cost assumptions are also highly variable because there are no currently operating facilities in Massachusetts or the

northeast to base a comparison. Therefore, many of the assumed numbers are based on CDM Smith’s assumptions of the solid waste market and experience with similar facilities. Also, many of the factors such as the percent of the incoming waste that has to be removed as digestate and the associated costs will vary significantly with the type of technology utilized. CDM Smith’s general assumptions for each of the significant cost items for the two tonnage scenarios are summarized on table 4-2.

For the purpose of this analysis, CDM Smith has maintained a low cost for the sale of electricity (\$0.06 per kilowatt hour). This is included to be conservative but significantly higher costs could be realized if the project could be tied to the Town’s electric usage through a process like “net-metering” currently allowed for solar photovoltaic and wind energy generating facilities. CDM Smith notes that the current net-metering regulations do not allow the electricity from anaerobic digestion facilities.

**Table 4-2**  
**Summary of Comparative Unit Costs for Anaerobic Digestion Facility at Hamilton Landfill**

Revenue and Cost Item	Assumed Tons Per Day		Notes/Units
	100 <sup>1</sup>	200 <sup>1</sup>	
Tons Organic Waste Accepted Per Year	26,000	52,000	
Anticipated Per Ton Tip Fee for Incoming Organic Waste	\$ 40	\$ 40	Per Ton in 2015
Facility Rated Electric Generation	1,000	2,000	kilowatts
Electricity Availability	90%	90%	
Annual Electrical Generation	7.9	15.8	MW-hours per year
Net Unit Revenue from Electricity	\$0.06	\$0.06	per kilowatt-hour
Assumed Capital Cost	\$5,000,000	\$8,000,000	Highly variable – assumes simple system
Percent Capital Assumed for Annual O&M	5%	5%	
Percent of Incoming Waste Removed as Digestate	35%	35%	Varies based on technology selected
Cost Per Ton Including Hauling for Digestate Disposal	\$ 15	\$ 15	Assumes nearby reliable off-site disposal and hauling – highly variable

1. Assumed 5 days per week, 52 weeks per year.

### 4.3 Comparative Cost and Present Value Analysis

For the two tonnage scenarios, 100 and 200 tons per day (accepted five days per week), CDM Smith developed a 15-year annual estimate of facility revenues and costs. CDM Smith then calculated the Present Value of each year’s revenues and costs and summed the total Present Value over 15-years to determine the approximate value of the project over the 15-year life-cycle. The full 15-year life cycle cost spreadsheets are presented in the appendices. The estimates of revenues and operations costs for select years (2015, 2020 and 2025) are presented on Tables 4-3 and 4-4 for the 100 and 200 tons per day scenarios, respectively.

The total 15-year present value of the net returns for the 100 ton per day facility is approximately \$2.2 million or an average of less than \$150,000 per year in 2015 dollars. For the 200 ton per day facility, the present value of the net returns is significantly higher at over \$12 million or an average of

\$800,000 per year. Clearly, the ability to attract an adequate waste stream is a significant differentiator in the financial viability of the proposed facility.

**Table 4-3**  
**Summary of Annual Operating Costs and Revenues**  
**for 100 Ton Per Day Anaerobic Digestion Facility**

Revenue or Cost Item	Calendar Year		
	2015	2020	2025
Amortization of Capital Cost	\$(482,000)	\$(482,000)	\$(482,000)
Operation and Maintenance	\$(250,000)	\$(282,000)	\$(337,000)
Annual Host Community Fee	\$(78,000)	\$(90,000)	\$(105,000)
Labor Allowance	\$(400,000)	\$(464,000)	\$(538,000)
Cost for Off-Site Hauling and Disposal of Digestate	\$(137,000)	\$(158,000)	\$(183,000)
Annual Monitoring and Reporting (Allowance)	\$(80,000)	\$(93,000)	\$(108,000)
Annual Revenues from Electricity Sales	\$473,000	\$549,000	\$636,000
Annual Revenue from Tipping Fees	\$1,040,000	\$1,205,000	\$1,396,000
<b>TOTAL ANNUAL NET REVENUES</b>	<b>\$87,000</b>	<b>\$177,000</b>	<b>\$279,000</b>
Present Value – Annual Net Revenues	\$87,000	\$141,000	\$176,000

Note: Cost items are shown in parentheses. Costs and revenues are rounded to nearest \$1,000.

**Table 4-4**  
**Summary of Annual Operating Costs and Revenues**  
**for 200 Ton Per Day Anaerobic Digestion Facility**

Revenue or Cost Item	Calendar Year		
	2015	2020	2025
Amortization of Capital Cost	\$(771,000)	\$(771,000)	\$(771,000)
Operation and Maintenance	\$(400,000)	\$(464,000)	\$(538,000)
Annual Host Community Fee	\$(156,000)	\$(181,000)	\$(210,000)
Labor Allowance	\$(550,000)	\$(639,000)	\$(741,000)
Cost for Off-Site Hauling and Disposal of Digestate	\$(273,000)	\$(316,000)	\$(366,000)
Annual Monitoring and Reporting (Allowance)	\$(100,000)	\$(115,000)	\$(130,000)
Annual Revenues from Electricity Sales	\$946,000	\$1,096,000	\$1,271,000
Annual Revenue from Tipping Fees	\$2,080,000	\$2,410,000	\$2,793,000
<b>TOTAL ANNUAL NET REVENUES</b>	<b>\$776,000</b>	<b>\$1,020,000</b>	<b>\$1,304,000</b>
Present Value – Annual Net Revenues	\$776,000	\$811,000	\$824,000

Note: Cost items are shown in parentheses. Costs and revenues are rounded to nearest \$1,000.

#### 4.3.1 Assessment of “Break-Even” Tonnage

As requested by the Town, CDM Smith conducted an additional financial analysis to determine the required tonnage so that the present value of the net revenues is approximately zero. All other financial parameters were kept the same and the capital cost of the facility was assumed to be the same as the 100-tpd facility. The 15-year life cycle cost analysis is provided in the appendices. Based

on this analysis, the facility will “break-even” with the present values of revenues approximately equal to the costs at 80 tons per day.

## 4.4 Available Organic Waste Sources

In March 2012, the MassDEP issued the results of a food waste generator survey updating a prior study completed in 2002<sup>1</sup>. The most recent survey included annual generation data on various food waste generators including restaurants, hospitals, colleges, supermarkets and food manufacturers. These are the types of businesses that will likely be targeted by the waste ban on the disposal in landfills and waste-to-energy plants or acceptance at transfer stations of commercially generated source separated organic wastes. Note that the details of this proposed ban, scheduled for 2014, are currently being developed by a MassDEP task force.

To assess the availability of food waste in the vicinity of Hamilton, CDM Smith reviewed the 2012 survey information for food waste generators located close to Hamilton in the communities of Beverly, Danvers, Essex, Ipswich, Manchester-by-the-Sea, Gloucester and Rockport and totaled the reported estimated quantity of commercially generated organics waste. By including these communities, CDM Smith has assumed a relatively small watershed for the organic materials that could be delivered to a facility in Hamilton. The summary table of the generators identified by MassDEP for these communities is presented in the appendices.

From these communities, the MassDEP estimated a total of over 9,100 tons of commercially generated organic waste being generated. For reference, a 100 ton per day facility (5 days per week waste acceptance) will require 26,000 tons per year of organic waste. Extending the potential watershed to the two adjacent communities of Salem and Peabody adds approximately 6,100 tons per year of commercial organic waste identified by the MassDEP survey.

CDM Smith notes that approximately one-quarter of the facilities identified by MassDEP in these communities did not have any estimated tonnages including some significant potential food manufacturers and other generators. The survey did not identify other potential organic waste sources including agricultural wastes or wastewater treatment residuals. Therefore, we anticipate that the total commercial organic waste stream generated would be significantly higher than these estimates. Also, the MassDEP study does not include any consideration of residentially generated curbside collected or drop-off organic waste since this portion of the waste stream is not a focus of the proposed waste ban by MassDEP.

## 4.5 Renewable Portfolio Standards and Tax Incentives

The Commonwealth has established a Renewable Energy Portfolio Standard (RPS) that requires that suppliers to obtain a percentage of electricity from qualifying facilities for their retail customers. Suppliers meet their annual RPS obligations by acquiring a sufficient quantity of RPS-qualified renewable energy certificates (RECs). RECs are purchased from qualified generator at a premium based on an alternative penalty rate that is established by the Massachusetts Department of Energy

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<sup>1</sup> “Identification, Characterization and mapping of Food Waste and Food Waste Generators in Massachusetts,” prepared for the MassDEP by Draper/Lemon, Inc. September 19, 2002.

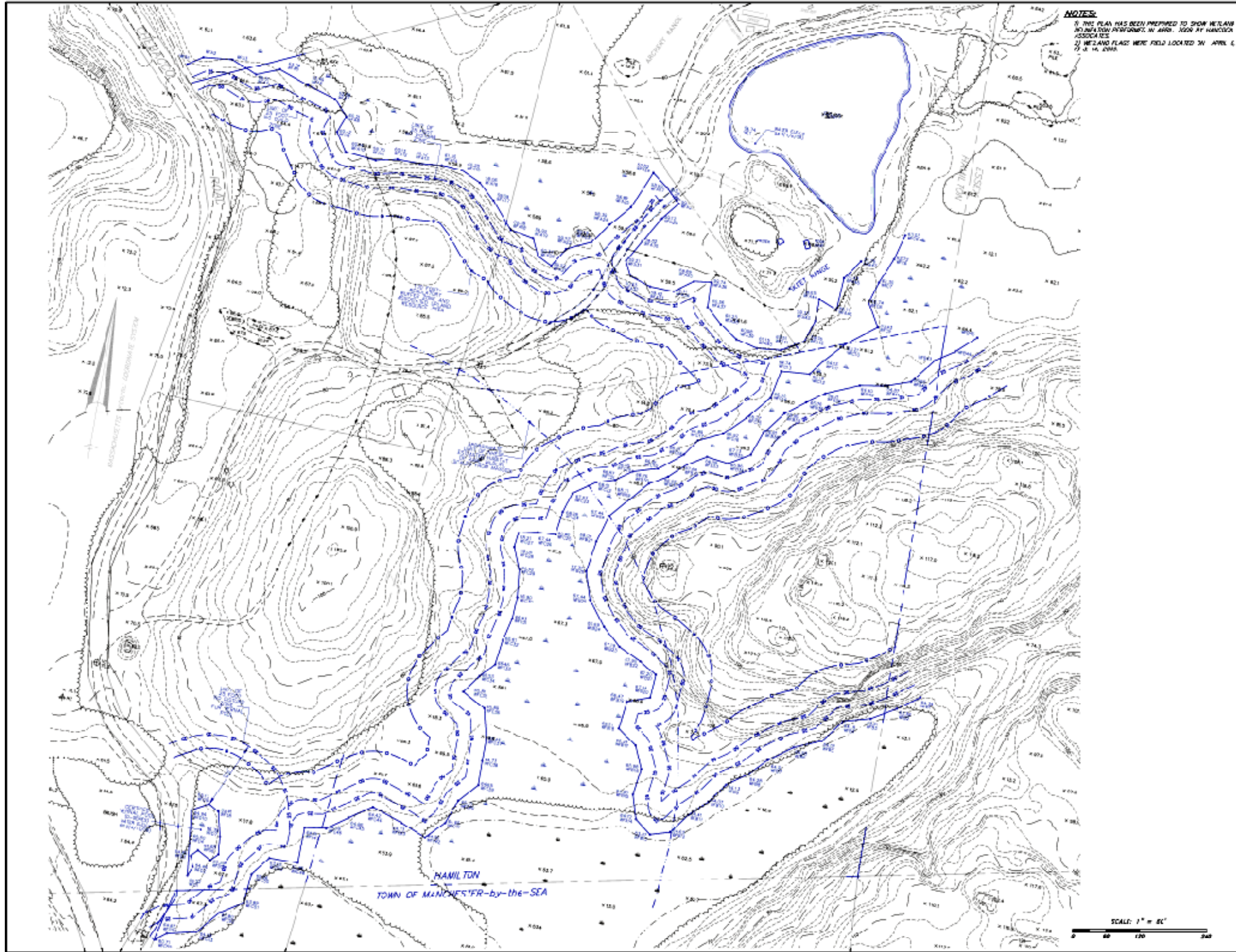
Resources (DOER). The RPS regulations are intended to provide a financial incentive for developers to build renewable energy facilities.

Facilities that generate electricity using anaerobic digestion gas qualify toward the RPS. The source separated organic waste processing facility envisioned by the Town would therefore appear to qualify for financial incentives under the RPS if the facility used an anaerobic digestion process and the resulting digester gas was used to generate electricity. Additional financial incentives may also be available from the federal government depending on the type of renewable energy project being proposed and the in-service date.

CDM Smith did not include any potential revenues from the Renewable Energy Portfolio Standard (RPS) for the sale of renewable energy certificates. This market is still developing and there is some uncertainty as to the applicability of specific technologies to this program so the analysis conducted herein is conservative. In addition, there are several federal tax incentive programs that this type of facility may qualify for based on the technology selected, the continuation of the incentive programs and schedule for implementation. Both the REC's and the tax incentives would increase the revenues from operation of the proposed anaerobic digestion facility.

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**Appendix A**  
**Copy of Hancock Associates Map Showing Wetland  
Resource Areas**



**NOTES:**  
 1) THIS PLAN HAS BEEN PREPARED TO SHOW WETLAND DELINEATION PERFORMED IN APRIL 2008 BY HANCOCK ASSOCIATES  
 2) WETLAND FLAG WERE FIELD LOCATED ON APRIL 6, 7 & 14, 2008.

**HAMILTON  
 LANDFILL**

Chatham Road  
 Hamilton, Massachusetts

PREPARED FOR  
**THE TOWN OF HAMILTON**  
 P.O. Box 429  
 Hamilton, Massachusetts 01936

**HANCOCK  
 ASSOCIATES**

Civil Engineers  
 Land Surveyors  
 Wetland Scientists

100 EAST STREET, HANOVER, MA 01920  
 VOICE 978-737-3800 FAX (978) 734-7866  
 WWW.HANCOCKGODAT.COM

NO.	BY	DATE	DESCRIPTION
1	AS PREPARED	04/06/08	BY HANCOCK ASSOCIATES
2	REVISED	04/14/08	BY HANCOCK ASSOCIATES

**EXHIBIT  
 PLAN OF LAND  
 IN  
 HAMILTON, MA**

DATE: 04/14/08  
 LAYOUT: EXHIBIT  
 SHEET: 1 OF 1  
 PROJECT NO.: 04790

**EX-1**

SCALE: 1" = 50'  
 0 50 100 150 200



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**Appendix B**  
**15 Year Cost Analysis Spreadsheets**

**Table B-1  
Summary of Estimated Revenues and Costs - Development of Anaerobic Digester at Hamilton Landfill - Low Range (100 TPD)**

Cost or Revenue Item	Year														
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Amortization of Capital Cost	(\$482,000)	(\$482,000)	(\$482,000)	(\$482,000)	(\$482,000)	(\$482,000)	(\$482,000)	(\$482,000)	(\$482,000)	(\$482,000)	(\$482,000)	(\$482,000)	(\$482,000)	(\$482,000)	(\$482,000)
Operation and Maintenance	\$ (250,000)	\$ (258,000)	\$ (266,000)	\$ (274,000)	\$ (282,000)	\$ (290,000)	\$ (299,000)	\$ (308,000)	\$ (317,000)	\$ (327,000)	\$ (337,000)	\$ (347,000)	\$ (357,000)	\$ (368,000)	\$ (379,000)
Annual Host Community Fee Payment	\$ (78,000)	\$ (80,000)	\$ (82,000)	\$ (84,000)	\$ (87,000)	\$ (90,000)	\$ (93,000)	\$ (96,000)	\$ (99,000)	\$ (102,000)	\$ (105,000)	\$ (108,000)	\$ (111,000)	\$ (114,000)	\$ (117,000)
Labor Allowance	\$ (400,000)	\$ (412,000)	\$ (424,000)	\$ (437,000)	\$ (450,000)	\$ (464,000)	\$ (478,000)	\$ (492,000)	\$ (507,000)	\$ (522,000)	\$ (538,000)	\$ (554,000)	\$ (571,000)	\$ (588,000)	\$ (606,000)
Cost for Off-Site Hauling and Disposal of Digestate	\$ (136,500)	\$ (141,000)	\$ (145,000)	\$ (149,000)	\$ (153,000)	\$ (158,000)	\$ (163,000)	\$ (168,000)	\$ (173,000)	\$ (178,000)	\$ (183,000)	\$ (188,000)	\$ (194,000)	\$ (200,000)	\$ (206,000)
Annual Monitoring and Reporting (Allowance)	\$ (80,000)	\$ (82,000)	\$ (84,000)	\$ (87,000)	\$ (90,000)	\$ (93,000)	\$ (96,000)	\$ (99,000)	\$ (102,000)	\$ (105,000)	\$ (108,000)	\$ (111,000)	\$ (114,000)	\$ (117,000)	\$ (121,000)
Annual Revenues from Electricity Sales	\$ 473,000	\$ 487,000	\$ 502,000	\$ 517,000	\$ 533,000	\$ 549,000	\$ 565,000	\$ 582,000	\$ 599,000	\$ 617,000	\$ 636,000	\$ 655,000	\$ 675,000	\$ 695,000	\$ 716,000
Annual Revenue from Tipping Fees	\$ 1,040,000	\$ 1,071,000	\$ 1,103,000	\$ 1,136,000	\$ 1,170,000	\$ 1,205,000	\$ 1,241,000	\$ 1,278,000	\$ 1,316,000	\$ 1,355,000	\$ 1,396,000	\$ 1,438,000	\$ 1,481,000	\$ 1,525,000	\$ 1,571,000
<b>TOTAL</b>	<b>\$ 86,500</b>	<b>\$ 103,000</b>	<b>\$ 122,000</b>	<b>\$ 140,000</b>	<b>\$ 159,000</b>	<b>\$ 177,000</b>	<b>\$ 195,000</b>	<b>\$ 215,000</b>	<b>\$ 235,000</b>	<b>\$ 256,000</b>	<b>\$ 279,000</b>	<b>\$ 303,000</b>	<b>\$ 327,000</b>	<b>\$ 351,000</b>	<b>\$ 376,000</b>
Present Value	\$86,500	\$98,000	\$111,000	\$122,000	\$132,000	\$141,000	\$148,000	\$156,000	\$163,000	\$169,000	\$176,000	\$183,000	\$188,000	\$193,000	\$198,000
Year from Start		1	2	3	4	5	6	7	8	9	10	11	12	13	14
<b>Total Present Value</b>	<b>\$2,264,500</b>														

**Assumptions**

Tons Per Day Received	100	Assume 5 days per week, 52 weeks per year	26,000	tons per year
Anticipated Per Ton Tip Fee	\$ 40	Per Ton in 2014		
Normalizing Discount Rate	4.7%			
Assumed Borrowing Interest Rate	5.0%			
Assumed CPI	3%			
Rated Electric Generation	1000	kw		
Electricity Availability	90%	7,884	MW-hr/year	
Net Revenue from Electricity	\$ 0.06	per kw-hr		
Assumed Capital Cost	\$5,000,000			
Percent Capital Assumed for O&M	5%			
Percent of Incoming Waste Removed as Digestate	35%			
Cost Per Ton Including Hauling for Digestate Disposal	\$ 15			
Host Community Fee (Assumed)	\$3	Per Ton in 2015		

**Table B-2  
Summary of Estimated Revenues and Costs - Development of Anaerobic Digester at Hamilon Landfill - High Range (200 TPD)**

Cost or Revenue Item	Year														
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Amortization of Capital Cost	(\$771,000)	(\$771,000)	(\$771,000)	(\$771,000)	(\$771,000)	(\$771,000)	(\$771,000)	(\$771,000)	(\$771,000)	(\$771,000)	(\$771,000)	(\$771,000)	(\$771,000)	(\$771,000)	(\$771,000)
Operation and Maintenance	\$ (400,000)	\$ (412,000)	\$ (424,000)	\$ (437,000)	\$ (450,000)	\$ (464,000)	\$ (478,000)	\$ (492,000)	\$ (507,000)	\$ (522,000)	\$ (538,000)	\$ (554,000)	\$ (571,000)	\$ (588,000)	\$ (606,000)
Labor Allowance	\$ (550,000)	\$ (567,000)	\$ (584,000)	\$ (602,000)	\$ (620,000)	\$ (639,000)	\$ (658,000)	\$ (678,000)	\$ (698,000)	\$ (719,000)	\$ (741,000)	\$ (763,000)	\$ (786,000)	\$ (810,000)	\$ (834,000)
Annual Host Community Fee Payment	\$ (156,000)	\$ (161,000)	\$ (166,000)	\$ (171,000)	\$ (176,000)	\$ (181,000)	\$ (186,000)	\$ (192,000)	\$ (198,000)	\$ (204,000)	\$ (210,000)	\$ (216,000)	\$ (222,000)	\$ (229,000)	\$ (236,000)
Cost for Off-Site Hauling and Disposal of Digestate	\$ (273,000)	\$ (281,000)	\$ (289,000)	\$ (298,000)	\$ (307,000)	\$ (316,000)	\$ (325,000)	\$ (335,000)	\$ (345,000)	\$ (355,000)	\$ (366,000)	\$ (377,000)	\$ (388,000)	\$ (400,000)	\$ (412,000)
Annual Monitoring and Reporting (Allowance)	\$ (100,000)	\$ (103,000)	\$ (106,000)	\$ (109,000)	\$ (112,000)	\$ (115,000)	\$ (118,000)	\$ (122,000)	\$ (126,000)	\$ (130,000)	\$ (134,000)	\$ (138,000)	\$ (142,000)	\$ (146,000)	\$ (150,000)
Annual Revenues from Electricity Sales	\$ 946,000	\$ 974,000	\$ 1,003,000	\$ 1,033,000	\$ 1,064,000	\$ 1,096,000	\$ 1,129,000	\$ 1,163,000	\$ 1,198,000	\$ 1,234,000	\$ 1,271,000	\$ 1,309,000	\$ 1,348,000	\$ 1,388,000	\$ 1,430,000
Annual Revenue from Tipping Fees	\$ 2,080,000	\$ 2,142,000	\$ 2,206,000	\$ 2,272,000	\$ 2,340,000	\$ 2,410,000	\$ 2,482,000	\$ 2,556,000	\$ 2,633,000	\$ 2,712,000	\$ 2,793,000	\$ 2,877,000	\$ 2,963,000	\$ 3,052,000	\$ 3,144,000
<b>TOTAL</b>	<b>\$ 776,000</b>	<b>\$ 821,000</b>	<b>\$ 869,000</b>	<b>\$ 917,000</b>	<b>\$ 968,000</b>	<b>\$ 1,020,000</b>	<b>\$ 1,075,000</b>	<b>\$ 1,129,000</b>	<b>\$ 1,186,000</b>	<b>\$ 1,245,000</b>	<b>\$ 1,304,000</b>	<b>\$ 1,367,000</b>	<b>\$ 1,431,000</b>	<b>\$ 1,496,000</b>	<b>\$ 1,565,000</b>
Present Value	\$776,000	\$784,000	\$793,000	\$799,000	\$806,000	\$811,000	\$816,000	\$819,000	\$821,000	\$823,000	\$824,000	\$825,000	\$825,000	\$823,000	\$823,000
Year from Start		1	2	3	4	5	6	7	8	9	10	11	12	13	14
<b>Total Present Value</b>	<b>\$12,168,000</b>														

**Assumptions**

Tons Per Day Received	200	Assume 5 days per week, 52 weeks per year	52,000 tons per year
Anticipated Per Ton Tip Fee	\$ 40	Per Ton in 2014	
Normalizing Discount Rate	4.7%		
Assumed Borrowing Interest Rate	5.0%		
Assumed CPI	3%		
Rated Electric Generation	2000 kw		
Electricity Availability	90%	15,768 MW-hr/year	
Net Revenue from Electricity	\$ 0.06	per kw-hr	
Assumed Capital Cost	\$8,000,000		
Percent Capital Assumed for O&M	5%		
Percent of Incoming Waste Removed as Digestate	35%		
Cost Per Ton Including Hauling for Digestate Disposal	\$ 15		
Host Community Fee (Assumed)	\$3	Per Ton in 2015	

**Table B-3  
Summary of Estimated Revenues and Costs - Development of Anaerobic Digester at Hamilon Landfill - Breakeven Tonnage Evaluation**

Cost or Revenue Item	Year														
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Amortization of Capital Cost	(\$482,000)	(\$482,000)	(\$482,000)	(\$482,000)	(\$482,000)	(\$482,000)	(\$482,000)	(\$482,000)	(\$482,000)	(\$482,000)	(\$482,000)	(\$482,000)	(\$482,000)	(\$482,000)	(\$482,000)
Operation and Maintenance	\$ (250,000)	\$ (258,000)	\$ (266,000)	\$ (274,000)	\$ (282,000)	\$ (290,000)	\$ (299,000)	\$ (308,000)	\$ (317,000)	\$ (327,000)	\$ (337,000)	\$ (347,000)	\$ (357,000)	\$ (368,000)	\$ (379,000)
Annual Host Community Fee Payment	\$ (62,400)	\$ (64,000)	\$ (66,000)	\$ (68,000)	\$ (70,000)	\$ (72,000)	\$ (74,000)	\$ (76,000)	\$ (78,000)	\$ (80,000)	\$ (82,000)	\$ (84,000)	\$ (87,000)	\$ (90,000)	\$ (93,000)
Labor Allowance	\$ (400,000)	\$ (412,000)	\$ (424,000)	\$ (437,000)	\$ (450,000)	\$ (464,000)	\$ (478,000)	\$ (492,000)	\$ (507,000)	\$ (522,000)	\$ (538,000)	\$ (554,000)	\$ (571,000)	\$ (588,000)	\$ (606,000)
Cost for Off-Site Hauling and Disposal of Digestate	\$ (109,200)	\$ (112,000)	\$ (115,000)	\$ (118,000)	\$ (122,000)	\$ (126,000)	\$ (130,000)	\$ (134,000)	\$ (138,000)	\$ (142,000)	\$ (146,000)	\$ (150,000)	\$ (155,000)	\$ (160,000)	\$ (165,000)
Annual Monitoring and Reporting (Allowance)	\$ (80,000)	\$ (82,000)	\$ (84,000)	\$ (87,000)	\$ (90,000)	\$ (93,000)	\$ (96,000)	\$ (99,000)	\$ (102,000)	\$ (105,000)	\$ (108,000)	\$ (111,000)	\$ (114,000)	\$ (117,000)	\$ (121,000)
Annual Revenues from Electricity Sales	\$ 473,000	\$ 487,000	\$ 502,000	\$ 517,000	\$ 533,000	\$ 549,000	\$ 565,000	\$ 582,000	\$ 599,000	\$ 617,000	\$ 636,000	\$ 655,000	\$ 675,000	\$ 695,000	\$ 716,000
Annual Revenue from Tipping Fees	\$ 832,000	\$ 857,000	\$ 883,000	\$ 909,000	\$ 936,000	\$ 964,000	\$ 993,000	\$ 1,023,000	\$ 1,054,000	\$ 1,086,000	\$ 1,119,000	\$ 1,153,000	\$ 1,188,000	\$ 1,224,000	\$ 1,261,000
<b>TOTAL</b>	<b>\$ (78,600)</b>	<b>\$ (66,000)</b>	<b>\$ (52,000)</b>	<b>\$ (40,000)</b>	<b>\$ (27,000)</b>	<b>\$ (14,000)</b>	<b>\$ (1,000)</b>	<b>\$ 14,000</b>	<b>\$ 29,000</b>	<b>\$ 45,000</b>	<b>\$ 62,000</b>	<b>\$ 80,000</b>	<b>\$ 97,000</b>	<b>\$ 114,000</b>	<b>\$ 131,000</b>
Present Value	(\$78,600)	(\$63,000)	(\$47,000)	(\$35,000)	(\$22,000)	(\$11,000)	(\$1,000)	\$10,000	\$20,000	\$30,000	\$39,000	\$48,000	\$56,000	\$63,000	\$69,000
Year from Start		1	2	3	4	5	6	7	8	9	10	11	12	13	14
<b>Total Present Value</b>	<b>\$77,400</b>														

**Assumptions**

Tons Per Day Received	80	Assume 5 days per week, 52 weeks per year	20,800 tons per year
Anticipated Per Ton Tip Fee	\$ 40	Per Ton in 2014	
Normalizing Discount Rate	4.7%		
Assumed Borrowing Interest Rate	5.0%		
Assumed CPI	3%		
Rated Electric Generation	1000 kw		
Electricity Availability	90%	7,884 MW-hr/year	
Net Revenue from Electricity	\$ 0.06	per kw-hr	
Assumed Capital Cost	\$5,000,000		
Percent Capital Assumed for O&M	5%		
Percent of Incoming Waste Removed as Digestate	35%		
Cost Per Ton Including Hauling for Digestate Disposal	\$ 15		
Host Community Fee (Assumed)	\$3	Per Ton in 2015	

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## **Appendix C**

### **Market Information from MassDEP Database**

**Table C-1**  
**Summary of Food Waste Generation (Tons Per Year) for Cape Anne Communities**

Based on 2012 MassDEP Survey Database

DEP_Code	Name	Street_Add	Town_City	Type	Generation (tons/year)
G514	Stop & Shop	301 Newbury St.	Danvers	G	335.85
G551	Stop & Shop	37 Enon St	Beverly	G	300
R3818	Danversport Grill and Bistro	161 Elliott St	Danvers	R	300
G219	Henrys of North Beverly	588 Cabot St	Beverly	G	277.5
G412	Shaws	71 Dodge St	Beverly	G	225
G482	Star Market	65 Dodge St	Beverly	G	225
G584	Stop & Shop	224 Elliott St	Beverly	G	198
G593	Stop & Shop	50 Independence Way Ste 3	Danvers	G	198
IC23	Endicott College	376 Hale Street	Beverly	IC	185.976
G266	Market Basket	139 Endicott St	Danvers	G	180
R3783	Vinwood Caterers	3 Union St	Ipswich	R	172.5
IC84	North Shore Community College	1 Ferncroft Rd	Danvers	IC	150.9165
R3758	McT's Lobster House & Tavern	25 Rogers St	Gloucester	R	150
G431	Shaws	127 Eastern Ave	Gloucester	G	150
R3726	Texas Roadhouse	301 Newbury St	Danvers	R	139.5
IH11	BEVERLY HOSP/BEVERLY CAMPUS	85 HERRICK STREET	BEVERLY	IH	139.18545
R3717	Village Restaurant of Essex	55 Main St	Essex	R	127.5
IC27	Gordon College	255 Grapevine Road	Wenham	IC	118.07775
R3664	Giordano's Restaurant	18 Mount Carmel Rd	Danvers	R	112.5
R3614	Applebee's	50 Independence Way Ste 5	Danvers	R	105
G118	Crosbys Marketplace	3 Summer St	Manchester	G	105
R3482	Beverly Depot Rest & Saloon	10 Park St	Beverly	R	90
R3484	Brandi Holten Foods	10 Garden St	Danvers	R	90
R3500	Chili's	10 Newbury St Ste 1	Danvers	R	90
R3524	Nick & Tony's Saltwater Cafe	29 Andover St	Danvers	R	90
R3557	TGI Friday's	49 Newbury St	Danvers	R	90
R3419	The Village Green	225 Newbury St	Danvers	R	82.5
G36	Bell Market	206 Cabot St	Beverly	G	75
R3345	Not Your Average Joe's	45 Enon St Unit 1	Beverly	R	75
R3385	William J. Creed & Sons Ltd.	17 E Corning St	Beverly	R	75
R3242	99 Restaurant The	60 Commonwealth Ave	Danvers	R	75
R3329	Kelly's Roast Beef	165 Endicott St	Danvers	R	75
R3358	Pizzeria Uno	194 Endicott St	Danvers	R	75
R3322	Gull Restaurant	75-77 Essex Ave	Gloucester	R	75
G448	Shaws	7 Railroad Ave	Gloucester	G	75
R3202	Lobsta Land	84 Causeway St	Gloucester	R	67.5
IH280	ESSEX PARK REHABILITATIN & NUR	265 ESSEX STREET	BEVERLY	IH	66.357
R3041	Bertucci's Brick Oven Pizzeria	27 Enon St	Beverly	R	60
G289	McKinnons Market	73 Holten St	Danvers	G	60
R3135	Sam & Joe's Restrnt	30 Water St	Danvers	R	60
R3146	Supino's Restaurant	250 Newbury St	Danvers	R	60
R3107	Marlin Blue Grille	65 Eastern Ave	Essex	R	60
R3152	Tim Hopkins Catering	8 Scotts Way	Essex	R	60
R3053	Cameron's Restaurant	206 Main St 208	Gloucester	R	60
R3136	Seven Seas Wharf	63 Rogers St Ste B2	Gloucester	R	60
R3057	Clam Box of Ipswich	246 High St	Ipswich	R	60
G451	Shaws	146 High St	Ipswich	G	60
R3066	Ellen's Harborside	1 T Wharf	Rockport	R	60

R3067	Fish Shack Restaurant	21 Dock Sq	Rockport	R	60
R3046	Black Cow Tap & Grill	16 Bay Rd	South	R	60
R2942	Fuddrucker's	66 Cherry Hill Dr Ste 200	Beverly	R	52.5
R2986	Tom Sheas Restaurant	122 Main St	Essex	R	52.5
R2992	Woodman's Restaurant and	121 Main St	Essex	R	52.5
R2928	Friendly's	226 Washington St	Gloucester	R	52.5
R2980	Studio Restaurant	51 Rocky Neck Ave	Gloucester	R	52.5
IH484	RADIUS HEALTHCARE CTR at	56 LIBERTY STREET	DANVERS	IH	52.2315
R2875	Chuck E. Cheese's	139 Endicott St	Danvers	R	49.5
R2879	Jalapenos Mexican Restaurant	86 Main St	Gloucester	R	49.5
R2884	Seven Central Street Rest	7 Central St	Manchester	R	49.5
IH68	BEVERLY HOSP/ADDISION GILBERT	298 WASHINGTON STREET	GLOUCESTE	IH	49.30785
R2867	Putnam Pantry Candies	255 Newbury St	Danvers	R	48
G228	IGA Foodliner Supermarket	35 Whistlestop Mall	Rockport	G	48
IH521	SEACOAST NURSING & REHAB	292 WASHINGTON STREET	GLOUCESTE	IH	46.647
C144	Sheraton Ferncoft Resort- Danvers	50 Ferncroft Road	Danvers	C	45.6
R2575	Crockers Brenden Wild Horse Cafe	392 Cabot St	Beverly	R	45
R2638	McDonald's	40 Enon St Ste 5	Beverly	R	45
R2555	Calitri's Restaurant	126 Newbury St	Danvers	R	45
R2644	McDonald's	77 High St	Danvers	R	45
R2734	Ponte Vecchio Restaurant	435 Newbury St Ste 101	Danvers	R	45
R2501	Alchemy Cafe & Bistro	3 Duncan St	Gloucester	R	45
R2648	McDonald's	50 Maplewood Ave Ste 11	Gloucester	R	45
R2496	1640 Harthouse	51 Linebrook Rd	Ipswich	R	45
C164	The Mansion on Turner Hill	251 Topsfield Road	Ipswich	C	43.8
IH369	KINDRED TRNSTNL CR&REHB-	75 BRIMBAL AVENUE	BEVERLY	IH	43.362
IH378	LEDGEWOOD REHAB & SKLD	87 HERRICK STREET	BEVERLY	IH	40.4055
IH345	HUNT NURSING & REHABILITATION	90 LINDALL STREET	DANVERS	IH	39.42
R2371	McDonald's	230 Elliott St	Beverly	R	39
R2387	The Cabot Place	256 Cabot St	Beverly	R	39
R2350	Burger King	184 Endicott St	Danvers	R	39
R2386	Rhumb Line Restaurant	40 Railroad Ave	Gloucester	R	39
R2050	Anchor Post and Grill	20 Cabot St	Beverly	R	37.5
R2107	China Jade	44r Dodge St	Beverly	R	37.5
R2132	Dunkin' Donuts	139 Endicott St	Danvers	R	37.5
R2198	McDonald's	135 Andover St	Danvers	R	37.5
R2199	McDonald's	50 Independence Way	Danvers	R	37.5
R2335	Wendy's	188 Endicott St	Danvers	R	37.5
R2180	Lewis's of Essex	234 John Wise Ave	Essex	R	37.5
R2131	Dragon Light Restaurant	226 Washington St Ste 128	Gloucester	R	37.5
G203	Hamilton Star Pantry Sprmkt	15 Walnut Rd	Hamilton	G	37.5
R2323	The Lobster Pool	329 Granite St	Rockport	R	37.5
R2327	The Weathervane Tavern	85 Railroad Ave	South	R	37.5
R2025	Cherry Farm Creamery	210 Conant St	Danvers	R	36
R2006	New Brothers Deli & Restaurant	31 Maple St	Danvers	R	34.5
IH563	TWIN OAKS CARE & REHABILITATIO	63 LOCUST STREET	DANVERS	IH	33.1785
IH300	GOLDEN LIVINGCENTER - GLOUCEST	272 WASHINGTON STREET	GLOUCESTE	IH	33.1785
R1963	Halibut Point	289 Main St	Gloucester	R	33
R1966	Ithaki Mediterranean Cuisine	25 Hammatt St	Ipswich	R	33
IH168	CEDAR GLEN CARE & REHABILITATI	44 SUMMER STREET	DANVERS	IH	32.85
R1922	KFC	6 Purchase St	Danvers	R	31.5
R1919	Franklin Cafe Cape Ann	118 Main St	Gloucester	R	31.5
R1568	Casa De Lucca	146 Rantoul St Ste 148	Beverly	R	30
R1646	Great American Barbecue	35r River St	Beverly	R	30

R1773	River Street Grille	98 River St	Beverly	R	30
R1793	Starbucks	29 Enon St	Beverly	R	30
R1553	Brutole Brick Oven Brewery	65 Newbury St	Danvers	R	30
R1860	Dunkin' Donuts	50 Independence Way	Danvers	R	30
R1757	Periwinkles	74 Main St	Essex	R	30
R1595	Destino's	129 Prospect St	Gloucester	R	30
R1689	Majestic Dragon	81 Newbury Port Tpke	Ipswich	R	30
IS9	Landmark School	429 Hale Street	Beverly	IS	29.34225
R1447	Kc's Restaurant and Pub	24 West St	Beverly	R	27
IH439	NEW ENG HOMES FOR THE DEAF	154 WATER STREET	DANVERS	IH	26.6085
R1404	Harry's 240	240 Rantoul St	Beverly	R	25.5
IH363	KINDRED NURSING AND REHAB-	44 SOUTH STREET	ROCKPORT	IH	24.966
R1373	Passports	110 Main St	Gloucester	R	24
R1389	The Patio of Magnolia	12 Lexington Ave	Gloucester	R	24
G40	Beverly North Food Mart Inc	1 Dodge St Ste A	Beverly	G	22.5
R1059	Dairy Queen	479 Cabot St	Beverly	R	22.5
R1187	Organic Garden Vegetarian Eatery &	294 Cabot St	Beverly	R	22.5
R1190	Papa Gino's	314 Cabot St	Beverly	R	22.5
R1224	Prinzi's Gourmet Pizza	5a Dodge St	Beverly	R	22.5
R1050	Custom Catering	9 Madison Ave	Danvers	R	22.5
R1096	Fortune Palace 2	99 Main St	Essex	R	22.5
R982	Amelia's	78 Thatcher Rd	Gloucester	R	22.5
G226	Hoopers Market Inc	6 School St	Manchester	G	22.5
G221	Hildonens I G A	35 Railroad Ave	Rockport	G	22.5
R908	Kame Restaurant	250 Cabot St	Beverly	R	21
R936	Starbucks	242 Elliott St	Beverly	R	21
R898	Domino's Pizza	85 Maple St	Danvers	R	21
R922	Papa Gino's	156 Andover St Unit 6	Danvers	R	21
G91	Brunis Farm Country Store	36 Essex Rd	Ipswich	G	21
IH618	CRESCENT MANOR REST HOME	5 CRESCENT STREET	GRAFTON	IH	19.053
R501	Braccia's Four 66 Pub	466 Newbury St	Danvers	R	18
R615	Hong Dynasty	12 Maple St	Danvers	R	18
R726	Radici Ristorante	275 Independence Way	Danvers	R	18
R658	Maria's Pizza	35 Pearl St	Gloucester	R	18
R804	White Farms	326 High St	Ipswich	R	18
R805	Zabagliones Restaurant	10 Central St	Ipswich	R	18
IH191	ST JULIE BILLIART RESID CARE C	30 JEFFREY'S NECK ROAD	IPSWICH	IH	17.739
R415	Goodies Ice Cream	46 Maple St	Danvers	R	16.5
R436	Rocco's Pizza House	26 Maple St	Danvers	R	16.5
R458	Top Dog	2 Doyle Cove Rd	Rockport	R	16.5
R70	Chianti Cafe & Grill	285 Cabot St	Beverly	R	15
R184	Joes Pizza	507 Rantoul St	Beverly	R	15
R79	Chuch's Restaurant	68 Maple St	Danvers	R	15
R294	Simard's Super Sub	85 High St	Danvers	R	15
R329	Sweetest Thing	206 Western Ave	Essex	R	15
R351	The Hearthside Restaurant	109 Eastern Ave	Essex	R	15
R354	The Pilot House	3 Porter St	Gloucester	R	15
IH55	NEW ENGLAND REHAB HOSP@	75 LINDALL STREET 2ND FLOOR	DANVERS	IH	12.483
IC79	Montserrat College of Art	23 Essex Street	Beverly	IC	5.8212
C42	Courtyard By Marriott	275 Independence Way	Danvers	C	0
C132	Residence Inn By Marriott	51 Newbury St	Danvers	C	0
G535	Stop & Shop	6 Thatcher Road	Gloucester	G	0
G705	Whole Foods -Pigeon Cove	11 Parker Street	Gloucester	G	0
F122	Captain Dustys Ice Cream Fact	5 1/2 Judson St	Beverly	F	



F173	Columbus Baking Co Inc	34 W Dane St 36	Beverly	F	
W345	Peaceworks	100 Cummings Ctr Ste 111k	Beverly	W	
F99	Brutole Brick Oven Brewery	65 Newbury St	Danvers	F	
F208	Diluigi's Inc.	41 Popes Ln	Danvers	F	
F250	Fishery Products International	18 Electronics Ave	Danvers	F	
W138	Fishery Products International	18 Electronics Ave	Danvers	W	
W292	Naked Foods International	22 Mill St	Danvers	W	
W314	North Atlantic Lobster Co., Inc.	107 Water St	Danvers	W	
F590	Pretzel Time	100 Independence Way	Danvers	F	
F599	Putnam Pantry	Us Rt 1	Danvers	F	
W433	Snapple Beverages of Boston	17 Collins St	Danvers	W	
W129	Essex Seafood	143 Eastern Ave	Essex	W	
W472	The John B Wright Fish Co Inc	10 Deer Hill Rd	Essex	W	
F56	Bellyache Cove Crafters I	52 Magnolia Ave	Gloucester	F	
F114	Cape Ann Seafoods Inc	417 Main St	Gloucester	F	
F120	Cape Seafoods, Inc.	3 State Pier Unit A	Gloucester	F	
W67	Capt Joe & Sons	95 E Main St	Gloucester	W	
W68	Captain Carlos Seafood	29 Harbor Loop	Gloucester	W	
F188	Custom Seasonings Inc.	12 Heritage Way	Gloucester	F	
F251	Flavrz Beverage Corporation	33 Commercial St Ste 3	Gloucester	F	
F302	Good Harbor Fillet Company	33 Commercial St	Gloucester	F	
F307	Gorton Inc	128 Rogers St	Gloucester	F	
W201	International Lobster	111 E Main St	Gloucester	W	
W202	Intershell Seafood	46-52 Commercial St	Gloucester	W	
F381	J T Seafoods Inc	4 Smith St	Gloucester	F	
F383	Ja-Ca Seafood Products CO Inc	417 Main St	Gloucester	F	
W227	Juncker Associates and Company	3 State Fish Pier 1	Gloucester	W	
W246	Lewis Mills & Co	128 Main St Ste 3	Gloucester	W	
F495	National Fish & Seafood Inc	11 Parker St	Gloucester	F	
W300	National Fish and Seafood, Inc.	11-15 Parker St Ste 2	Gloucester	W	
F497	Neptune Seven Seas Inc	88 Commercial St	Gloucester	F	
W306	New England Marine Resources,	417 Main St	Gloucester	W	
F511	Nichols Candies Inc	1 Crafts Rd	Gloucester	F	
F519	North Atlantic Fish Co., Inc.	88 Commercial St Ste 1	Gloucester	F	
F533	Ocean Crest Seafoods Inc	27 Harbor Loop	Gloucester	F	
W357	Pigeon Cove Whole Food Market	11-15 Parker St	Gloucester	W	
W403	S Parisi & Son Seafoods Inc	108 Commercial St	Gloucester	W	
F655	Sasquatch Smoking Company	44 Whittemore St	Gloucester	F	
W447	Steve Connolly Seafood Company,	431 Main St	Gloucester	W	
F836	Zeus Packing, Inc.	27-29 Harbor Loop	Gloucester	F	
F403	Junction Ice Cream Inc	606 Essex St	Hamilton	F	
F371	Ipswich Shellfish Co Inc	8 Hayward St	Ipswich	F	
F463	Mercury Brewing & Distribution Co	25 Hayward St	Ipswich	F	
F477	Modern Fish Company	8 Topsfield Rd	Ipswich	F	
F690	Soffron Brothers Inc	2 Soffron Ln	Ipswich	F	
F625	Rockport Fudge	4 Tuna Wharf	Rockport	F	
<b>Totals</b>					<b>9,136</b>

**Table C-2**  
**Summary of Food Waste Generation (Tons Per Year) for Salem and Peabody**

Based on 2012 MassDEP Survey Database

DEP_Code	Name	Street_Add	Town_City	Type	Generation (tons/year)
R3179	99 Restaurant & Pub	15 Bridge St	Salem	R	67.5
R1338	A Taste of Time Cafe	122 Washington St	Salem	R	24
W10	Ae Goulet Inc	102 Jackson St	Salem	W	
R478	Bangkok Paradise	90 Washington St	Salem	R	18
R2895	Bertinis	284 Canal St	Salem	R	52.5
W46	Bloomsberry & Co	92 Jackson St	Salem	W	
R2482	Bob's Famous Fried Clams	429 Highland Ave	Salem	R	43.5
IH610	BROOKHOUSE HOME FOR	180 DERBY STREET	SALEM	IH	11.826
W57	Bubble Chocolate, LLC	92 Jackson St	Salem	W	
R2833	Burger King	259 Highland Ave	Salem	R	46.5
F109	California Olive Oil Corp	134 Canal St	Salem	F	
R81	Cilantro	282 Derby St Ste 1	Salem	R	15
G115	Crosbys Market Place	125 Canal St Ste 4	Salem	G	187.5
G116	Crosbys Marketplace	109 Canal St	Salem	G	45
G117	Crosbys Marketplace	426 Essex St	Salem	G	187.5
R1064	Dairy Witch	117 Boston St	Salem	R	22.5
R1083	Dube's Restaurant	317 Jefferson Ave	Salem	R	22.5
R127	Essex New York Deli & Pizza	1 E India Square Mall #	Salem	R	15
R3397	Fantasy Island	516 Loring Ave	Salem	R	78
R3590	Finz Seafood Grill	76 Wharf St	Salem	R	97.5
W164	Gold Star Coffee Co Inc	51a Bridge St	Salem	W	
R2152	Grapevine Resteraunt The	26 Congress St	Salem	R	37.5
IH314	GROSVENOR PARK	7 LORING HILLS AVENUE	SALEM	IH	40.4055
F323	Harbor Sweets Inc	85 Leavitt St	Salem	F	
R1124	In A Pigs Eye	148 Derby St	Salem	R	22.5
F384	Jacquelines Gourmet Cookies	96 Swampscott Rd Ste 1	Salem	F	
R203	Leslie's Retreat	96 North St	Salem	R	15
R3339	Lyceum Bar & Grill	43 Church St	Salem	R	75
R1165	Maria's Place	10 Jefferson Ave	Salem	R	22.5
R1707	McDonald's	1 Traders Way	Salem	R	30
R2675	Minos Enterprises	9 Bridge St	Salem	R	45
IH116	NORTH SHORE MED	81 HIGHLAND AVENUE	SALEM	IH	170.39295
R244	Periwinkles Food Shoppe	540 Loring Ave	Salem	R	15
R1505	Red's Sandwich Shop	15 Central St	Salem	R	28.5
W402	S Anastasi Quality Foods	100 Jackson St	Salem	W	
F644	Salem Beer Works	278 Derby St	Salem	F	
R3134	Salem High Schl	77 Willson St	Salem	R	60
IC46	Salem State University	352 Lafayette Street	Salem	IC	699.040125
F645	Salem's Old Fashioned	93 Canal St	Salem	F	
G430	Shaws	11 Traders Way	Salem	G	150
IH117	SPAUDING HOSP FOR CNTING	DOVE AVENUE	SALEM	IH	99.864
R958	Starbucks	211 Washington St	Salem	R	21
R2307	Stromberg's Restaurant	2 Bridge St	Salem	R	37.5
G638	Super Shaws	293 Highland Ave	Salem	G	375
R2014	Taco Bell	267 Highland Ave	Salem	R	34.5
IH554	TCU at SPAULDING HOSP	DOVE AVENUE	SALEM	IH	13.14
R3642	Victoria Station	86 Wharf St Ste 5	Salem	R	105
F809	Whatsknew, Inc.	35 Congress St Ste 19	Salem	F	

DEP_Code	Name	Street_Add	Town_City	Type	Generation (tons/year)
F832	Ye Olde Pepper CO	122 Derby St	Salem	F	
G7	A & P Variety Store	60 Aborn St	Peabody	G	262.5
G8	A Plus Market Inc	50 Central St	Peabody	G	7.5
R3652	Bertucci's Brick Oven Pizzeria	15 Newbury St	Peabody	R	112.5
R2558	Capone's Restaurant	147 Summit St Ste 20	Peabody	R	45
R3492	Carrabba's	1 Newbury St Ofc	Peabody	R	90
R3691	Charlie Brown's Steak House	210 Andover St Unit 212p	Peabody	R	120
R1482	Chick-Fil-A	210 Andover St Unit 3	Peabody	R	28.5
R1489	Chipotle Mexican Grill	210 Andover St	Peabody	R	28.5
R97	D Angelos Sandwich Shop	210 ANDOVER ST	PEABODY	R	15
R1078	Domino's Pizza	6 Bourbon St Ste 4	Peabody	R	22.5
R3076	Friendly's	250 Andover St	Peabody	R	60
R1102	Giovanni's Pizza & Roast Beef	672 Lowell St	Peabody	R	22.5
F296	Godiva	210 Andover St	Peabody	F	
G205	Hannaford	637 Lowell St Frnt	Peabody	G	255
R1138	KFC	256 Andover St	Peabody	R	22.5
IH108	KINDRED HOSPITAL-BOSTON	15 KING STREET	PEABODY	IH	31.2075
IH109	LAHEY CLINIC NORTH (INPT	1 ESSEX CENTER DRIVE 1 2	PEABODY	IH	6.2415
R1453	Land & Sea	67 Lynnfield St	Peabody	R	27
R3519	LEGAL SEA FOODS	210 Andover St Unit 42	Peabody	R	90
R202	Lena's Pizza & Subs	200 Washington St	Peabody	R	15
C108	Marriott	8 Centennial Dr A	Peabody	C	0
R1411	McDonald's	210 Andover St Unit 6	Peabody	R	25.5
R2661	McDonald's	133 Main St	Peabody	R	45
R225	Munty's Sub & Pizza	4 Lake St Ste 6	Peabody	R	15
G304	New England Meat Market	60 Walnut St	Peabody	G	75
R1188	Oriental Jade Restaurant	4 Bourbon St	Peabody	R	22.5
R2966	Outback Steakhouse	300 Andover St Frnt	Peabody	R	52.5
F552	P B Hart Co Inc (Treadwell's	46B Margin Street Ct	Peabody	F	
IH467	PEABODY GLEN HEALTH CARE	199 ANDOVER STREET	PEABODY	IH	49.275
IH470	PILGRIM REHAB & SKILLED	96 FOREST STREET	PEABODY	IH	49.932
IH491	RENAISSANCE GARDENS AT	400 BROOKSBY VILLAGE	PEABODY	IH	28.908
IH493	RENAISSANCE GARDENS II at	400 BROOKSBY VILLAGE	PEABODY	IH	5.256
IH504	ROSEWOOD NURSING &	22 JOHNSON STREET	PEABODY	IH	44.3475
R929	Santoro's of Peabody	41 Main St	Peabody	R	21
R283	Sbarro	200 Andover St Spc F1	Peabody	R	15
R287	Seawitch Seafood Restaurant	203 Newbury St	Peabody	R	15
G404	Shaws	114-128 Essex Center Dr	Peabody	G	225
R872	Starbucks	240 Andover St Ste E	Peabody	R	19.5
R954	Starbucks	210 Andover St Unit 102	Peabody	R	21
G489	Stop & Shop	19 Howley Street	Peabody	G	276.825
R1798	Su Chang	373 Lowell St	Peabody	R	30
G633	Super Shaws	114 Northshore Rd 128	Peabody	G	225
F723	Supper Time USA	18 Northfield Rd	Peabody	F	
R3765	Sylvan Street Grille	12 Sylvan St	Peabody	R	150
F731	TAC Tannins	58 Pulaski St	Peabody	F	
R455	Taco Bell	210 Andover St Unit 8	Peabody	R	16.5
R3830	The Cheesecake Factory	210 Andover St Unit 137	Peabody	R	348
F760	Treadwells Ice Cream	46 Margin Street CT	Peabody	F	
R1822	Victorian Motor Inn	14 Sylvan St	Peabody	R	30
R1825	Wardhurst Club	31 Lynnfield St	Peabody	R	30
R2807	Wendy's	71 Newbury St	Peabody	R	45

DEP_Code	Name	Street_Add	Town_City	Type	Generation (tons/year)
<b>Total</b>					<b>6174</b>

