Doing the Right Thing

Municipal Recycling Programs on Long Island in the 1990s

Part I of An Assessment of Recycling on Long Island

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Executive Summary

This report is the first part of a six-part series on recycling on Long Island. This part, Doing the Right Thing, discusses the growth and extent of municipal recycling programs.

Long Island, as considered in this report, is comprised of Nassau and Suffolk Counties. It contains a population of approximately 2.6 million. It is primarily suburban in character; most of the suburbanization occurred after World War II. Some portions of western Nassau County are considered urbanized. The eastern portions of Suffolk County contain agricultural and/or undeveloped land, and tourist resorts. Suffolk County still generates more income from agriculture than any other county in New York.

Municipally-sponsored recycling on Long Island began in earnest after the Islip Garbage Barge incident, in 1986. The Town of Islip was the first to institute mandatory source separation

of recyclables from the general waste stream. All 15 of the waste management planning districts on Long Island (three Towns, Hempstead, North Hempstead, and Oyster Bay, and two Cities, Glen Cove and Long Beach, in Nassau County; and the ten Towns of Babylon, Brookhaven, East Hampton, Huntington, Islip, Riverhead, Shelter Island, Smithtown, Southampton, and Southold in Suffolk County) have mandatory source separation for both residential and commercial generated recyclables. Although each program is idiosyncratic, almost all residents must separate corrugated cardboard, newspaper, metal and aluminum cans, HDPE and PET plastic containers, and glass bottles from other garbage. Many other residents must separate junk mail or "mixed" paper, as well. Particular programs may expand this list. Residents are also given the opportunity to recycle yard wastes and bulk metal (white goods), generally, along with other materials in various municipalities (including, but not limited to, waste oil, car batteries, telephone books, high grade paper, and magazines).

The Town of Babylon is the only municipality that offers comprehensive collection of commercially-generated recyclables. Some municipalities, such as Glen Cove, Hempstead, Huntington, and Long Beach offer some limited commercial recyclables collection.

Most Long Island municipalities have issued containers to facilitate the separation of recyclables from the waste stream, and provide weekly collection service. The exceptions to this are four of the East End Towns (East Hampton, Shelter Island, Southampton, and Southold), which do not provide any municipal collection services. Residents of these Towns must either

separate recyclables at their local transfer station, or must separate the recyclables for collection by privately-arranged for carting services.

Several of the municipalities have constructed special facilities (MRFs -- Municipal Recycling Facilities, or Materials Recovery Facilities) to process collected recyclables. The most sophisticated of these facilities are in Brookhaven, Islip, and Smithtown. East Hampton and Oyster Bay also have processing capabilities, as does Sanitary District 1 in the Town of Hempstead. The Town of Babylon participated in the construction of a similar kind facility, which is owned and operated by a private concern. Other muncipalities use private facilities to process the collected recyclables for market.

Yard waste is treated specially. The five East End Towns (the four mentioned previously, plus Riverhead), Brookhaven, and Islip operate municipal composting facilities for yard wastes (as did Huntington and Oyster Bay in the early 1990s). All other municipalities contract with private concerns for yard waste composting (with the exception of Long Beach, which does not manage yard waste as a distinct waste). In addition, a waste reduction program called "Don't Bag It" is in place in Brookhaven, Islip, Huntington, Oyster Bay and Smithtown. This program is designed to encourage residents to let grass clippings lie on the lawn, or to be composted or mulched, along with leaves and other garden materials and clippings. This program is voluntary in Oyster Bay and Smithtown; in the three other Towns, grass clippings are no longer managed by the municipalities' collection services, and are treated as unacceptable solid wastes.

Another waste reduction strategy is in place in three of the East End Towns (Shelter Island, Southampton, and Southold). This is the "Pay-per-Bag" program. Wastes destined for disposal are only acceptable if bagged in special bags, sold by the municipalities (or their agents). The prices charged for the bags increase with greater bag volumes. This program is designed to minimize waste production, and, since recyclables are accepted at no charge, promote source separation. This program penalizes large waste producers financially, as a "user-pays" system.

Another waste reduction strategy, in place Long Island-wide except for Long Beach, is Stop Throwing Out Pollutants (STOP) programs. Thse are the separation from the general waste stream of hazardous household chemicals, such as pesticides, herbicides, solvents, and oil-based paints, and subsequent management of these materials through hazardous wastes programs. The five East End Towns, Brookhaven, and Huntington have all built special facilities that accept these wastes year-round. The other municipalities hold special STOP days at locations during the year for the convenience of their residents.

There are some notable recycling innovations offered by particular municipalities. The Town of East Hampton has built an enclosed composting facility, where source separated food wastes are composted. The Town is experimenting with compost feedstocks composed of other solid waste components. The Towns of Brookhaven and Riverhead have announced plans and begun procurement processes for general solid waste composting.

In line with these plans, these latter two Towns will also be constructing "dirty" MRFs, where recyclables are captured from the general waste stream (another intent of the process is to produce a feedstock for the solid waste composting process). The incinerator operator for City of Long Beach also plans a similar facility to capture recyclables remaining in the waste stream.

The Towns of Babylon and North Hempstead have experience with this process. Babylon's recycling facility, the Commercial and Residential Recycling Facility (CRRF), was constructed with this end in mind. The two Towns sent their commercial wastes to the facility for approximately one year (roughly, in 1993). The company running the facility failed, however; it is not clear whether the concept, design, or execution of the process was flawed. North Hempstead also used a Brooklyn dirty MRF at the same time for its residential waste stream, and, for approximately half a year after the end of the CRRF's operation, sent its commercial waste stream there. This ceased following a U.S. Supreme Court decision forbidding control of the waste stream by fiat (May, 1994), which made the economics of the program unworkable.

This Supreme Court decision, Carbone et al., has had other implications for recycling on Long Island. The decision restricts the ability of waste managers to designate a particular disposal or processing facility. The facilities must either compete on the open market, or be designated through contract (including, at this time, contracts associated with bid districts). This led Babylon to form its commercial garbage district. The primary intent of the Town was to guarantee waste flow to its Waste-to-Energy incinerator. A by-product of the district was the first municipal foray into comprehensive commercial recycling services. However, New York

State law forbids governmental interference with established recycling services, which has allowed for certain competition for recyclables at Babylon businesses. Therefore, the final scope of Babylon's commercial recycling program cannot be determined (the district began operation January 2, 1996).

A second result of the flow control litigation and decisions has been a certain reluctance by some municipalities to become involved in capitalized facilities, where revenues from waste flows are needed for financing. Explicitly, this has been a concern for the Towns of Oyster Bay and Brookhaven, which have been slow to implement recycling-related projects because of this uncertainty (among other concerns). It is not clear how this problem has, or will, affect the planning processes in other municipalities.

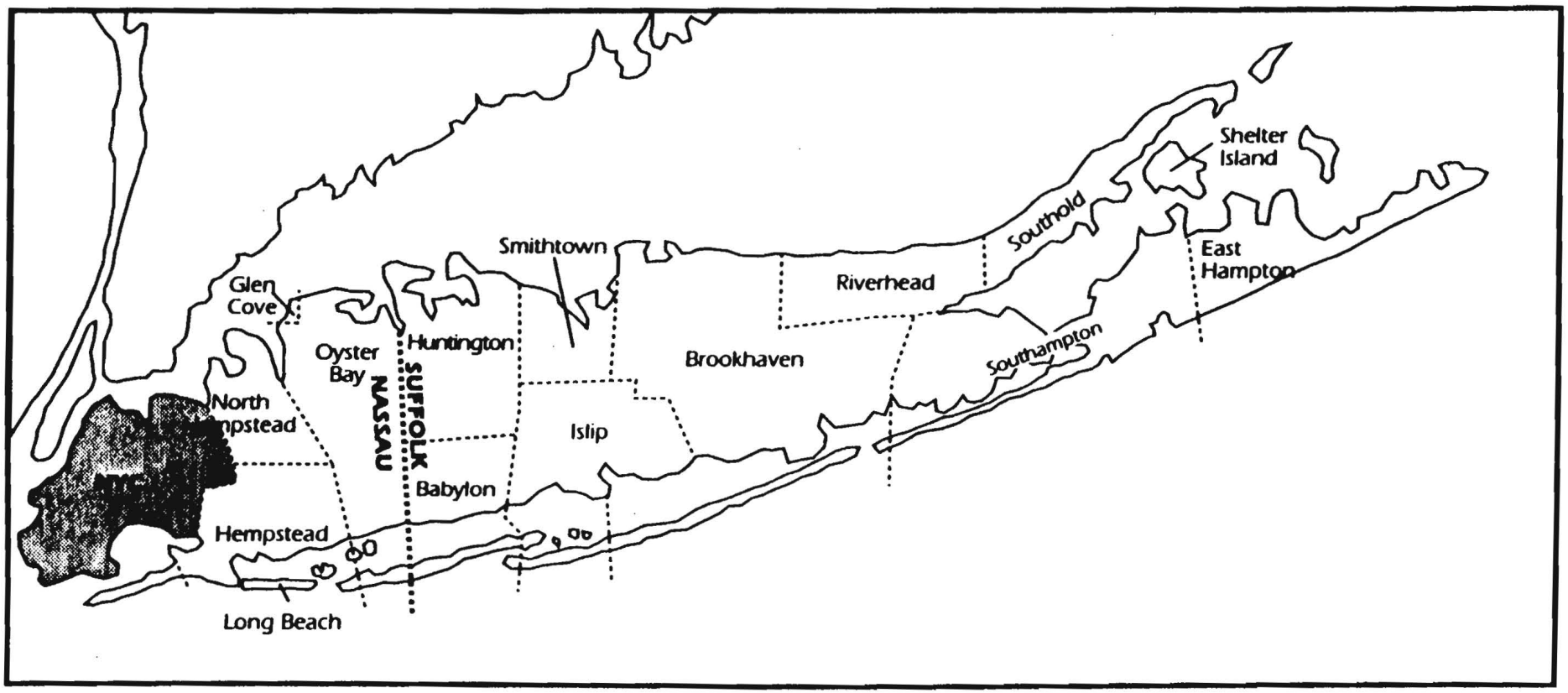
It is clear that municipally-sponsored recycling programs have grown tremendously over the past ten years or so. Prior to the Garbage Barge, there were only several voluntary programs, with extremely limited target materials. Now, extensive mandatory programs, with large degrees of public acceptance, extensive infrastructures, and important roles in waste management policies, are in place across all of Long Island. These programs, although mandated by State law, appear to have been established more because of citizen desire and waste management effectiveness than regulatory pressures. Most of the programs have been in their current state for several years, and may be described as "mature" rather than "fledgling." With some exceptions, mostly described above, program changes in the near future would appear to be limited to fine-tuning rather than major expansions.

Introduction

The Waste Reduction and Management Institute (WRMI) was established in 1985 by the New York State Legislature (as the Waste Management Institute). The mission of WRMI is to reduce the impact of waste generation on society through a program of research, assessment, education, and policy analysis. Locally, there is a need to compile accurate and credible information about Long Island's solid waste stream and infrastructure. This need was initially addressed by the publication of Where Does It All Go? in 1992 (Tonjes and Swanson).

Solid waste management on Long Island has evolved considerably since the data were collected for that report. This project began as an update to Where Does It All Go? In the course of data collection and analysis, it became obvious that certain aspects of Long Island's solid waste structure were deserving of study in and of themselves. The focus of the proposed update report became, instead, recycling and its associated processes. As our assessment grew, it

Figure 1. Long Island Municipalities



was suggested to us that the report had grown to unwieldy size, and would be of little utility if issued as a single document. We therefore have attempted to divide the inital report into manageable pieces.

This paper, Doing the Right Thing, is the first of a series of six related reports. All six of the reports discuss some aspect of recycling in Nassau and Suffolk Counties. Each report is intended to stand alone; however, the reader interested in all aspects of the recycling process on Long Island would reap the most benefit by reading the reports in order.

Doing the Right Thing is a report on the growth and evolution of Long Island's municipal recycling programs. This is a qualitative, descriptive account; Part II of the series, Comparing Apples and Oranges, discusses the programs quantitatively.

The report is organized by county, and then by planning unit within each county. Long Island contains 15 solid waste management planning units -- ten Towns in Suffolk County (Babylon, Brookhaven, East Hampton, Huntington, Islip, Riverhead, Shelter Island, Smithtown, Southampton and Southold), and the three Towns (Hempstead, North Hempstead, and Oyster Bay) and two cities (Glen Cove and Long Beach) in Nassau County (Figure 1). Although Brooklyn (Kings County)and Queens County are geographically part of Long Island, history, political divisions, and common usage exclude them from public policy discussions of Long Island issues. They are not discussed in this report.

Each Long Island municipality was asked to provide information to us during 1994 and 1995. Personal interviews were held with most of the municipal waste managers; others responded by telephone or letter. In addition, reports on Long Island waste management by governmental and environmental organizations were reviewed. Each municipality was given multiple opportunities to review and comment on drafts of our descriptions of its system, and to provide more complete or amended data sets. Some were more accomodating than others; although there is a lack of complete data in some of the accounts that follow, we believe that this is the most thorough and accurate account of overall Long Island recycling practices that has yet been made available.

Historical Overview

Long Island's municipal waste management infrastructure is organized differently from other areas of New York State. Elsewhere, waste management is the function of county government, or, in some instances, organizations comprised of groups of counties. On Long Island, the responsibility is assumed by Town or City government (the next lower level of government), and, even, in some aspects, by Village government. This has led to a multiplicity of approaches in a relatively restricted geographical space.

Recycling (defined for the moment as the separation from the waste stream, or potential waste stream, of materials to allow for reuse or refabrication) has almost certainly always occurred on Long Island. Composting and the recovery for refabrication of certain valuable materials have occurred throughout recorded history. Government-sponsored programs have not been as continuous. They seem to be restricted to times of war, with a focus on materials that

have use in supporting the war effort. Notable examples of such efforts in twentieth century America occurred during World Wars I and II (Melosi, 1981). These programs were discontinued with the end of the wars and the perceived lack of need for such civic effort.

Modern recycling on Long Island appears to have begun in scattered municipalities through the co-opting of paper drives. The Town of Huntington, for example, had some form of newspaper collection throughout the 1970s (Dvirka and Bartilucci, 1984). The initial goad to greater efforts appears to have been the notoriety of the famed Islip Garbage Barge incident (1986) (Reaven, 1987). To this was added the pressure of the nearing implementation of the Long Island Landfill Law (New York State Legislature, 1983), which mandated the closure of landfills on Long Island to unprocessed solid wastes by 1991 (as a means of protecting Long Island's "sole source" drinking water aquifers). The identification of a "solid waste hierarchy" by the State Legislature (1988) and its codification into state regulations (New York State Department of Environmental Conservation, 1988), where source reduction and recycling were identified as preferred waste management strategies that needed to be addressed in applications for solid waste facilities, certainly played a role. Pressures from residents to have municipal governments be environmentally responsible, coupled with the legal and regulatory strictures, made recycling part and parcel of every day waste management practices across Long Island.

The remainder of this report will detail, municipality by municipality, which recycling methodologies have been adopted in the various municipalities, which materials are collected, and where available, the destination of the collected materials. Information was collected through the

end of 1994; most of the discussions are complete and accurate through that time. As necessary, some other aspects of a particular municipality's waste management program may be briefly discussed.

Nassau County

Glen Cove

The City of Glen Cove is located in the north-east corner of the Town of Oyster Bay, on Hempstead Harbor. It has the smallest population of all the planning units in Nassau County (approximately 24,000) (Long Island, 1994). Outside of a core downtown area, most of the City is composed of relatively densely developed subrbanized streets. The City was one of the earliest population centers on the North Shore of Long Island.

Glen Cove's recycling program began in 1987. Recycling is provided once weekly, with the collection day varying depending upon the region of the City. Two municipal crews handle recycling. Containers are to be placed curbside in a blue bucket. Non-newspaper paper recyclables are to be placed in blue plastic bags. Newspaper is bundled separately (Tonjes and Swanson, 1992; Gardrvits, 1994).

Municipal crews also provide collection services to all residences, and to businesses that produce "residential-like" wastes (such as delicatessens, offices, and restaurants). Businesses that produce "industrial" wastes (such as gas stations and factories) must contract for private collection services (Gardrvits, 1994).

Universal Recycling (formerly A-1 Carting) in 1996 signed an agreement to manage the City's waste stream through a transfer station at the site of the City's former Waste-to-Energy (WTE) incinerator. The contract displaced Island Recycling, which in 1993 had signed a twenty-year contract to manage the City's collected wastes, and refurbish the City's incinerator (Smith, 1996). Island Recycling had sent the collected containers to Omni Recycling (Westbury) for processing, and managed the City's paper through its own resources (Gardrvits, 1994). It is not yet evident how Universal Recycling will manage the City's recyclables.

The City's contract with Island Recycling had called for the City to receive recycling services at no cost. This contract was signed in 1993 at a time when at least several Long Island municipalities were paying to have recyclable materials marketed. The City paid a disposal fee of \$74 ton^{-1} for other MSW and so intended to increase its recycling rate tremendously to minimize its MSW management costs (Gardrvits, 1994). The new contract for waste disposal has a low cost of only \$30 ton^{-1} (Smith, 1996); it is not clear that the same incentives for additional recycling will apply, at this rate. The low cost for waste disposal was apparently achieved by granting Universal the right to run its private sector transfer station business at the City's property.

Use of municipal crews for collection has allowed the City to police set-outs by residents carefully, and therefore ensure that the recyclables contain very little in the way of inappropriate materials (Gardrvits, 1994).

City residents can place up to ten bags of leaves and other yard waste curbside, up to three times a week. Branches must be bundled. Management of the yard wastes by Island Recycling, and its subcontractor, Joseph Graziose, had been somewhat controversial. The transfer station site did not have a permit to compost material. Graziose claimed that the material is merely processed on site (soil separated from other material and the organics prepared for transfer elsewhere for composting through grinding), and that any stockpiling of material had been short-term (Gardrvits, 1994; Russell, 1994). The City had received many odor complaints (Vincent, 1994). The City believed that Graziose's practice of accepting material from non-municipal sources had exacerbated the problems (Russell, 1994). Up to 80% of the materials processed through the Island Recycling site may have been from sources other than the Glen Cove municipal collection process (Gardrvits, 1994). The new arrangement will address the odor problems by explicitly banning any composting activities at the site (Smith, 1996).

The yard waste odor situation had been further complicated by odor problems at the wastewater treatment plant (which was also operated by Island Recycling at the same site). The City is the official permittee for the wastewater treatment plant. Therefore, the City was sued and is being held responsible by the New York Department of Environmental Conservation (NYSDEC) for the situation. This, together with the dispute between the City and Island

Recycling related to the re-opening of the incinerator, had created some difficulties in the relationship between Island Recycling and the City (Gardrvits, 1994; Russell, 1994; Ain, 1995a; Vincent, 1995). Island Recycling will continue to operate the wastewater treatment plant under the proposed new deal (Smith, 1996).

The City does not manage construction and demolition debris (C&D), but assigns that task to private industry (Gardrvits, 1994).

The City's mandatory recycling ordinance brings it into compliance with General Municipal Law (GML) 120-aa (Gardrvits, 1994). This State law requires every solid waste planning unit to have a local law requiring the source separation for recycling of all materials for which economically-feasible markets exist. GML-120-aa was passed by the Legislature in 1988, and became effective September 1, 1992 (New York State Legislature, 1992).

The City offers a twice-yearly STOP (Stop Throwing Out Pollutants) program to collect and properly dispose of hazardous household chemicals (Tonjes and Swanson, 1992).

Hempstead

The Town of Hempstead lies along the Queens County boundary, from the center of Long Island to the South Shore. It has the largest population of any planning unit on Long Island, with a population of approximately 725,000 (Long Island, 1994). Hempstead contains some areas that can be characterized as "urbanized," such as the Village of Hempstead; however, it is predominantly suburban in character. Some of these suburbs were established prior to World War II (such as Garden City); others, with Levittown as the example par excellence, were developed after the war. In general, there is little developable open space remaining in the Town.

Hempstead has a complicated solid waste management structure. It has evolved with the changes in waste management technologies, and the imposition of stricter environmental standards for waste management. These forces have tended to make smaller administrative and

political bodies surrender responsibilities to the larger entity (the Town) as complexities and costs have spiralled (Heil, 1994; Ronan, 1994).

The Town is responsible for overall direction of the program. Solid waste collection, and some degree of waste processing, are the responsibility of eight separate sanitation districts, only three of which are managed directly by the Town. Thirteen of the 15 villages within the Town also have taken responsibility for waste collection, and, in some instances, some waste processing. Thus, waste collection is managed by 19 separate organizations. Sanitary District 1 built its own Materials Recovery Facility (MRF); Sanitary District 1 and the villages of Rockville Center and Valley Stream operate transfer stations (CSI Resource Systems, 1993a; Ronan, 1994; Ronan, 1996).

Each jurisdiction follows slightly different collection procedures and rules. The areas serviced by the Town, for example, receive two collections of MSW a week, along with separate recyclables and yard waste collections. The Town also collects three containers on each set-out day from businesses, accounting for at least some of the commercial waste generated within the Town. The remainder of the wastes generated at each business must be disposed through private carting contracts. Other entities vary from this "standard." The collection districts are each staffed by district employees; in the villages, some hire carting firms, and others use village employees for collection (CSI Resource Systems, Inc., 1993a, 1993b; Ronan, 1994).

The Town does not know of any privately operated MSW transfer stations within the Town. There is one C&D processing center and transfer station (Ronan, 1994).

The curbside recycling program (begun in 1988) requires materials separation into the following groups: newspapers, junk mail and magazines; glass, plastic and metal consumer containers; plastics; and corrugated cardboard[1]. The Town uses specialized container trucks to collect the materials: the trucks have dividers that can be preset to account for differences in the volumes in each of the separately set-aside groups of materials. The Town also collects white goods and yard waste curbside. Other recyclables in the Town program are computer paper, high grade bond paper, waste oil, tires, reclaimed soil, sewage sludge, clamshells (from a seafood processor), timber and other wood, car batteries, and "other" metal (including ferrous reclaimed from the MSW incinerator ash). In January, 1996, the Town began a three month experiment allowing a local company to collect discarded mattresses for reuse. The Town is also considering adding fibers, such as old clothing, rugs, and floor pads to the recycling program. In 1997 the Town is expecting to add "Special Collection" days to its recycling program. On certain Wednesdays in January and February, the Town will be collecting items such as telephone books, clothing, and other "non-standard" recyclable materials. Along with these municipal recycling services, six private recycling firms operating within the Town report tonnages to the Town (CSI Resource Systems, Inc., 1993b; Ronan, 1994; Ronan, 1995; Beedenbender, 1996; Tonjes and Swanson, 1992).

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[1]Prior to January 1, 1996, the Town had collected the following materials (by set-out groupings): newspapers; junk mail; clear glass consumer containers; mixed, colored glass and metal consumer containers; and plastic containers.

The Town delivers recyclables directly to the recyclers. Omni Recycling manages containers; Westbury Paper takes the curbside paper goods. The Colletti company manages tires for the Town. The parent company of American Ref-Fuel, which manages the Town's WTE incinerator, is Browning-Ferris Industries (BFI). BFI also manages the Town's yard waste through composting sites in Pennsylvania, New Jersey, and Connecticut. Gershow Recycling handles the white goods (a special collection is made for Freon-containing objects) (Ronan, 1994).

Bulky objects are also collected separately, and are brought to the Town's transfer station. BFI hauls those objects which cannot be burnt to various landfills, including the Brookhaven landfill (Heil, 1994; Ronan, 1994; Ronan, 1996).

Disposal of residential C&D is also through BFI (shipped off Long Island). Collection is only provided for "small" amounts, and residents cannot drop-off any C&D at the Town transfer station. Larger amounts must be disposed through private firms (Ronan, 1994).

Large bulky, wood wastes collected by the Highway and Parks Departments that are unsuitable for inclusion in the composting waste stream, and cannot be used by the Waterways and Conservation wood waste program, are shredded and burnt at the WTE plant (Ronan, 1994).

The Town's recycling law is in accord with GML-120-aa. The Town used the Nassau County STOP program until it was discontinued, but now has its own program. The Town

scheduled ten STOP days at various locations in the Town over the past several years; the budget for these collections is approximately \$0.25 x 10^6 $year^{-1}$. In addition, the Town has created an in-house recycling program for old paints, and has a separate dry cell battery recycling program (batteries are also accepted through the STOP program). Containers have been placed at firehouses, schools, and certain stores for the household batteries (Ronan, 1994; Beedenbender, 1996).

Long Beach

The City of Long Beach lies along the Atlantic Ocean in south-central Hempstead Town. It is characterized by a mix of shoreline high-rise apartments, and dense suburban development. The City has a population slightly greater than Glen Cove, approximately 33,000 (Long Island, 1994).

Long Beach collects MSW and recyclables from all residences and the majority of the Town's commercial establishments. Some commercial entities (e.g., the school district, McDonald's, and Pier I Imports) contract with private carters for disposal, and these wastes are not managed or accounted for through the municipal program. The large percentage of the City's residents living in multi-unit housing tends to make Long Beach's MSW program somewhat different from most other programs on Long Island. Since "residential" collection includes the

large solid waste containers associated with apartment houses, the City has the equipment to manage commercial collections as well (Febrizio, 1994).

The curbside recycling program was begun in the mid-1980s with newspaper. By 1990, it included newspaper, commingled containers (glass, metal, and PET and HDPE plastics), and bulk metals (Tonjes and Swanson, 1992). The City began collecting newspaper and corrugated cardboard from commercial establishments in 1992. Some high grade office paper was recycled in 1993, and waste oil was collected. In 1994 and 1995, the program was further expanded. The City also now collects residentially-generated corrugated cardboard, telephone books, and mixed paper (junk mail, office paper, computer paper, etc.), all of which are commingled with the newspaper. Studies are underway to begin collecting Christmas trees again, and to add the school district to the City's commercial recycling program (Febrizio, 1994; Febrizio, 1995).

High-rise apartment buildings do pose a special problem for the recycling program. In 1993, recyclables were collected once a week from these buildings, as is done with other residences. Conversely, recycling collection occurred six days a week for the commercial "strip." It is thought that apartment recyclables were disposed as MSW because of a lack of storage space, and that treating these buildings more like the commercial sector could increase the recycling rate. In 1994, the City added a second recyclables collection day for most high-rise apartment buildings (Febrizio, 1994).

City workers bring recyclables to the City's transfer station. JLJ Recycling is responsible for managing the materials thereafter. The City receives a flat rate of \$20.15 ton^{-1} from JLJ, regardless of market conditions (Febrizio, 1995).

The former operators of the City's WTE plant had proposed constructing a preprocessing facility to recover additional recyclable materials from the waste stream. The preprocessor was to have been constructed in 1993. Environmental Resources and Disposal, the current incinerator operator, will implement that proposal, and also will enclose the plant's tipping floor. Construction is slated to begin early in 1996 (Tonjes and Swanson, 1992; Febrizio, 1995).

The City depends upon the private sector to process commercially-generated C&D (Febrizio, 1994). In 1995, due to an unparallelled amount of roadwork which generated large amounts of wastes, the City entered into a contract with Jamiaca Ash and Rubbish to manage City-generated C&D (Febrizio, 1995). Yard waste, apparently not generated in large quantities in such a densely populated area, is either disposed together with other MSW, or, if collected by a commercial landscaping firm, disposed through an outside-of-the-City facility.

The City is investigating participating in the Town of Hempstead STOP program. Its recycling law is in compliance with GML-120-aa (Febrizio, 1994).

North Hempstead

The Town of North Hempstead makes up the northwest corner of Nassau County. The villages along the North Shore were among the earliest inhabited parts of Long Island. North Hempstead's "suburban" character first developed as the site of summer or country estates for the wealthier residents of Manhattan (and it was the setting for F. Scott Fitzgerald's The Great Gatsby). These estates have mostly been broken up into developments. Port Washington and Great Neck are near-urban in character; however, much of the Town is suburban in character. There is little developable open space remaining. The Town's population is approximately 210,000 (Long Island, 1994).

North Hempstead collects residential MSW and recyclables from its residents through its incorporated villages' collection programs and contracts with private carters. It has been

estimated that up to 60% of the residential waste stream is managed through the villages (Miner, 1994).

The Town's recycling program began as a voluntary drop-off program in 1986. Newspaper recycling became mandatory in December of that year, with curbside collection provided. In 1987, the program expanded to include bottles and cans. A pilot program for plastics began in 1989, and PET and HDPE were mandated as recyclable in 1992. Junk mail and magazines are also recycled with newspaper at this time. Yard waste is another mandatory source-separated recyclable (the yard waste collection program began on a voluntary basis in 1992). The Town accepts scrap metal, motor oil, car batteries, office paper, corrugated cardboard, yard waste, white goods, and bulky items for recycling at the Town transfer station. Household batteries are collected through local schools (Tonjes and Swanson, 1992; Miner, 1994; Miner, 1996).

Currently, curbside paper and office paper and curbside containers go to Omni Recycling, white goods to Al Franza, Inc., aluminum scrap and car batteries to Parente & Sons, household batteries to Care Environmental Corp., and used oil to Certified Oil. Yard wastes are composted off Long Island through Omni Recycling (Miner, 1995).

An attempt by the Town to participate in an innovative, cooperative waste management program is of some interest. In October, 1992, North Hempstead signed an Inter-municipal Agreement (IMA) with the Town of Babylon. Babylon simultaneously executed 20-year

contracts with Star Recycling (Brooklyn) and Babylon Source Separation, Inc. (BSSI -- the consortium of carters responsible for Babylon's residential waste collection). These developments parcelled out responsibilities for North Hempstead's waste stream. Star Recycling was to manage all of the Town's collected residential wastes; North Hempstead was to ship 0.6×10^5 tpy to the Town of Babylon Commercial and Residential Recycling Facility (CRRF) at a maximum rate of 5×10^3 tons $month^{-1}$ (tpm), put-or-pay (that is, the Town guaranteed payment for that amount of wastes, whether it was actually delivered or not) through BNHI, the North Hempstead subsidiary of BSSI; and Star Recycling was to manage the remainder of the commercial waste stream. The transfer station, where the wastes collected within the Town are assembled for repackaging into larger trucks, was to be operated by a contractor. Originally, this was a subsidiary of the operator of the CRRF, Solar International, called North Hempstead Resources, Inc. After North Hempstead issued a declaration of default for failure to perform by North Hempstead Resources on December 16, 1992, Star Recycling began operating the transfer station on an interim basis (Jacob, 1994a; Kluesener, 1994; Miner, 1994; Town of North Hempstead, 1993).

Because of this agreement, which allowed the Town to cease out-of-state exports of MSW, on January 2, 1993, the Town's tip fee was reduced to \$88 ton^{-1} (from over \$100 ton^{-1}) (Miner, 1994). This fee was equivalent to the Babylon system cost of \$78 ton^{-1}, plus \$10 ton^{-1} to cover shipping costs (Jacob, 1994a). The Town, in possession of a State Court affirmed flow control ordinance (Fan, 1991), began to strictly apply its powers, partially to avoid the penalties associated with put-or-pay agreements. Part of the aim of the Town's use of flow control was to require the villages to use the waste management system assembled by the Town -- the villages

had tended not to use the expensive Town disposal facilities. The decrease in tipping fee, although still above local spot market prices, and the flow control enforcement, led to the return of much of the Town's generated wastes to its system. The IMA was judged a success, and the Town was able to take credit for a superior recycling rate (well over 40%) (Miner, 1994; Town of North Hempstead, 1993).

However, in 1994, two events combined to destroy the IMA. In January, the Town of Babylon declared the operator of the CRRF, Solar International, in default for failure to perform. This, legally, was a different event compared with the earlier failure of its subsidiary to manage the transfer station properly. The CRRF essentially did cease operations in mid-December 1993, however. The CRRF was to be closed until the Town of Babylon (in conjunction with Solar, as owner of the plant) could arrange for a new operator (Jacob, 1994a; Kluesener, 1994; Miner, 1994).

Because of this, and the change in transfer station operators, the Town of North Hempstead made a temporary switch in operational tactics. Residential wastes were shipped by Star to the Babylon WTE plant (with Huntington's plant used as a backup in case of oversupply at Babylon), and commercial wastes were taken by Star to its Brooklyn MRF. This switch was made because of the perception that commercial wastes contain a greater percentage of recoverable materials than residential wastes (Miner, 1994).

The second blow to the IMA was the U.S. Supreme Court decision in May, 1994, which invalidated flow control ordinances (C&A Carbone et al. vs. Town of Clarkstown et al., 1994). With the flow control ordinance illegal, and the Town's tipping fee so much greater than the spot market and off-Island shipping rates, the Town could no longer meet its put-or-pay obligations to its MSW disposers (Star and Babylon). The "Change in Law" provisions in the contracts were invoked, and the IMA was revoked.

In 1995, the Town solicited bids for long-term disposal of its MSW. The two lowest bidders were Star Recycling, and Chambers Development Company (Chambers is a large, national firm that primarily owns and operates landfills east of the Mississippi River). Chambers was awarded a 15-year contract. This is despite Star's slightly lower bid, because Chambers did not require that recyclables and other non-disposable MSW be managed through the arrangement, and for another, risk-aversive reason. Chambers manages or owns landfills in five states; should an interstate limitation on waste exports pass the Congress during the next 15 years, Chambers would be in a better position to manage the flow of Town wastes so as to minimize the effects on North Hempstead. The intial cost under this contract is \$48.59 ton^{-1}. The low cost to the Town allowed it to offer the villages within the Town a similar low waste management (transfer and disposal) fee of \$61.50 ton^{-1} (Smith, 1995a; Smith, 1995b; Miner, 1996).

Small quantities of cleanfill are accepted at the landfill. The material is used on roadways or for erosion control there. Omni Recycling disposes of any collected C&D (Miner, 1994; Miner, 1996).

In 1993, the Town received a permit to construct a new, \$8 x 10^6 transfer station. The Town hopes to recover 50% of this cost through Environmental Quality Bond Act (EQBA) funding. The EQBA program was established by New York State to assist local municipalities in resource recovery projects, and to aid with landfill capping costs. The old incinerator, site of the temporary transfer station, is finally being demolished (with the steel and other valuable, structural materials being recycled), with the transfer station being constructed at the same site. The construction is slated to be finished in July, 1996 (Miner, 1994).

The Town established a STOP program in 1993. The Town holds 3-4 collection dates each year. The Town's recycling law is in compliance with GML-120-aa (Miner, 1994).

Oyster Bay

The Town of Oyster Bay runs from Long Island Sound to the Atlantic Ocean on the eastern end of Nassau County. The north end of the Town is similar in character to much of North Hempstead, being composed of large estates, and developments formed out of estates. The southern portion of the Town is more similar to Hempstead, and is predominantly tract housing developed after World War II. Some of the North Shore villages, such as Oyster Bay, pre-date the Revolutionary War. A small amount of developable land remains in the Town. The Town's population is approximately 290,000 (Long Island, 1994).

Oyster Bay formed a solid waste management district in 1985 in response to the NYSDEC-ordered closure of its landfill and two incinerators. The district is staffed by municipal employees, and provides MSW and recyclables collection and disposal services to those regions of the Town that belong to the district. This includes some commercial properties, although the

majority of the Town's businesses receive waste management services through private contracts. A dozen or so villages, mostly located on the North Shore, comprising approximately 10% of the Town's population, opted out of the district. They have been managing their solid waste through their own means since then (Swenson, 1994a; Swenson, 1995; Lenz and Leupold, 1996).

Oyster Bay began its recycling program in the late 1980s. The program was phased in to allow the Town to adjust its plans to the realities uncovered through implementation of the plans. Oyster Bay, like the municipal program in Hempstead, uses special compartmentalized trucks to collect the recyclables. By 1990, the Town was collecting glass, metal, and plastic (HDPE and PET) containers, newspapers, leaves and Christmas trees from residences, and also was recycling automobile tires and batteries. The Town also had office paper recycling as a special program. The Town itself was recycling C&D and "cleanfill." In 1991, the Town added mixed paper (also called "junk mail") to the residential pick-up program, and separate special programs to recycle aluminum and "other" metals. In 1993, the Town added telephone book recycling to its special program list (Tonjes and Swanson, 1992; Swenson, 1994a; Swenson, 1995).

The Highway and Parks Departments have spread 60-70 Igloo-style recycling containers at parks, beaches, etc., to collect newspapers and containers. Train stations have proved to be exceptionally fruitful for newspaper collection (Swenson, 1994a).

The Town composted leaves collected curbside at the Syosset landfill for several years; that aspect of the Towns' composting program ceased due to closure activities at the site. The

Town composted its yard waste (both collected leaves, and yard waste dropped off at the recycling center) in 1993 through Long Island Compost in East Moriches (a subsidiary of Earth-Gro of Connecticut). In 1994, it used composting services through the efforts of Jamaica Ash and Rubbish. Star Recycling, in its transfer station operations for the disposal of residential MSW, had been given incentives to remove additional yard waste from the waste stream, but experienced difficulties separating yard wastes commingled with other MSW. The Town then reverted to using Jamaica Ash for its composting needs. The Parks Department and Highway Division have been active in collecting yard wastes, and ship between 100 and 200 tons per month. Although the Town does not make compost itself, it requires its composting contractor to provide the Town with 1,000 tons of compost a year (or 10% of the Town's delivery tonnage, whichever is greater) for distribution at no cost to Town residents (Swenson, 1994a; Lenz and Leupold, 1996).

The Town also has a voluntary "Don't Bag It" program. This program (and similar programs in place in other Long Island municipalities) is designed to encourage residents to leave grass clippings on their lawns, use mulching mowers, and/or compost yard wastes at home. This diverts wastes from the waste management system, reducing costs, and, because wastes are managed closer to the source of the wastes, it may be more efficient in recovering wastes for reuse. Some other municipalities also have mandatory versions of these programs (first enacted by the Town of Islip), where no grass clippings are to be collected from homeowners. Oyster Bay believes that the relatively small contribution by yard waste composting to its overall program is due to the success of its "Don't Bag It" program (Scully, 1994; Wurster, 1994; Lenz and Leupold, 1996).

Prior to May, 1995, the Town used a variety of vendors to process curbside-collected recyclables. For example, commingled containers were processed through Omni Recycling or JLJ Recycling in Brooklyn under various contracts. The Town used to market two grades of newspapers, sorted at the Town's recycling center, through vestiges of the Long Island Recycling Co-op, and also through its own direct markets. The Town also used to use Marcal Paper for mixed paper and magazines. In 1995, the Town awarded a combined contract (for 30 months) to P&P Paper Recycling Systems (Old Bethpage, NY) to separate and market all these materials. The Town received guaranteed returns for the products: a minimum of \$90 ton^{-1} for paper, and \$25 ton^{-1} for containers. This contract, besides returning guaranteed revenue from the recyclables, also allowed the Town to avoid considerable processing costs associated with paper sorting (Swenson, 1994a; Lenz and Leupold, 1996).

The Town also bids out contracts to recycle other materials. Tires are marketed through JLJ Recycling (although Tully Construction used to provide that service). White goods are sold through Star Recycling to Gershow Recycling. Auto batteries go to Battery Expeditors. Waste oil goes to AB Oil (formerly, it went to Arba Waste Oil) (Swenson, 1994a; Lenz and Leupold, 1996).

Cleanfill is used at the Town landfill. A 13-acre hole had been dug in anticipation of building a new landfill cell. Clean soils are being used to fill the hole, with the approval of NYSDEC. They are inspected three times before dumping for volatile organic compounds and other unacceptable material. Such care is used because of the site's location in the heart of the

Deep Flow Recharge zone (the area where recharge can percolate into the two deeper, more pristine aquifers of the Long Island aquifer system) (Swenson, 1994a).

Private commercial recycling efforts involving all categories of wastes also have been enumerated by the Town. Reporting of private recycling efforts is a requirement to receive a Town waste hauling license (Swenson, 1994a).

The Town is actively entertaining options for long-term waste management, including building a Materials Recovery Facility (MRF) or other recyclables processing facilities (Swenson, 1994a).

The Town has a very active STOP program. For example, in 1993 the Town held 10 days, collected almost 24 tons of solids and nearly 3.1×10^4 gallons of liquids. The cost for disposal in 1993 was $360,000. From 1986 to 1994, the Town spent nearly $\$1.25 \times 10^6$ to dispose of over a thousand tons of hazardous household materials (Swenson, 1994a).

The Town's recycling law meets the requirements of GML-120-aa (Swenson, 1994a).

Suffolk County

Babylon

The Town of Babylon forms the southwest corner of Suffolk County. Although some of the villages in the Town were population centers prior to the turn of the century, most of the Town was settled in the vast suburban development of Long Island after World War II. Babylon has very little developable land remaining. Its population is approximately 200,000 (Long Island, 1994).

The Town, in 1989, mostly to provide wastes for its WTE incinerator, passed flow control legislation, and established a Town-wide garbage district. This district is somewhat different in kind from many on Long Island. First of all, it is Town-wide, with one single bid for the entire district. The Town encouraged the formation of consortiums of local carters to bid for this contract. The winning bid was from a group of twelve local carters (Babylon Source Separation, Inc. -- BSSI). The consortium carters are provided with free disposal for up to two tons of MSW

per household serviced each year. They are also responsible for the collection of residentially source-separated recyclables. The carters are only paid for collection services. The households are taxed for the collection services and pro-rata disposal fees, however (Tonjes and Swanson, 1992).

Residential recycling began as a pilot program in October, 1988. The Town now has a curbside collection recycling program, an "Igloo" drop-off program, and a drop-off program at the Town "CRRF" (Commercial and Residential Recycling Facility). The Town also requires reports on private recycling by the Town commercial carters as licensing requirement (Tonjes and Swanson, 1992). Private recycling (mostly from businesses and institutions) will be allowed to continue under the various versions of the proposed commercial district (see below), as New York State law forbids interference by municipalities with established recycling programs (New York State Legislature, 1988).

Babylon collects newspaper, cans, and glass curbside; it collects cans, glass and plastic in the Igloos; it collects corrugated cardboard, tires, automobile batteries and waste oil at the recycling center; and white goods are picked up curbside, or accepted at the landfill. The landfill previously accepted small amounts of cement and concrete for road construction and maintenance. Materials recycled by commercial carters that the Town has included in at least some evaluations are: newspapers; corrugated cardboard; high grade paper; "other" paper; ferrous; mixed metals; glass; cement and concrete; trees; mixed C&D; and tires. Bottles and cans from the curbside program are processed through the CRRF; currently yard wastes are being

brokered through Rutigliano Paper Stock. Newspapers are marketed through connections established by the Long Island Recycling Co-op (Tonjes and Swanson, 1992; Jacob, 1994a; Kluesener, 1994).

The Town does not believe in recycling materials at any cost. The goals of the recycling program, according to Ron Kluesener, Commissioner of Environmental Control, are to recycle

> effectively and cost-efficiently. Recyclables are collected with the intent of recycling. The road to recycling is neither straight nor smooth, and sometimes flow-control, environmental, or financial considerations determine whether a material is recycled or not.

The Town has incinerated some paper and yard waste collected for recycling, either to adjust the BTU value of the incinerator's feedstock, or to receive the best value for these materials. (Incineration returns revenue to the Town by virtue of electrical generation.) (Jacob, 1994a; Kluessener, 1994)

Excess capacity at the Town's incinerator, which should be filled by the Town in order to most economically satisfy its debt service on the plant and its contract with the plant operator, Ogden-Martin, has dominated Town waste management planning over the past four years. For example, the Town was involved in several intricate arrangements with the Towns of Huntington and (indirectly) Islip to trade capacity for ash disposal (Tonjes and Swanson, 1992; Del Col, 1994a; Kluesener, 1994; Scully, 1994). More pertinently (for the purposes of this report), the Town conceived of the CRRF, partly to satisfy the need for MSW to incinerate at its plant.

Part of the CRRF's function was to receive and process the source separated recyclables collected in the Town. Part of the facility was to process C&D materials generated within the Town. Part of the facility was to process yard wastes and brush to prepare them for composting. The facility was also to serve as a pre-processor for the incinerator, removing recoverable recyclable materials from the MSW to be burnt. This seemingly would reduce the flow of materials to the plant. However, because of the greater volume of wastes in total managed through Town facilities, it would serve to provide the necessary tonnages needed by the incinerator (2.25×10^5 tpy) (Tonjes and Swanson, 1992).

The CRRF was designed during the days of high out-of-state disposal fees. The plan was that the Town's residential wastes, minus source separated recyclables, would be delivered straight to the incinerator. This waste stream was believed to be approximately 0.8×10^5 tpy. The Town therefore needed to supply another 1.25×10^5 tpy (villages within the Town also were required to use the plant). Because the Request for Proposal (RFP) process revealed that a bidder, Solar International, would guarantee the removal of 40% of the waste stream, the minimum plant size could be 2.0×10^5 tpy (60% of 2.0×10^5 tpy = 1.2×10^5 tpy). The plant was actually designed for 2.6×10^5 tpy (with the belief that either the Babylon or Huntington incinerators could absorb any residues from the CRRF in excess of the Babylon incinerator's capacity). Babylon agreed to 1.98×10^5 tpy put-or-pay, with Solar to provide the remaining wastes (Tonjes and Swanson, 1992; Jacob, 1994a; Kluesener, 1994).

The actual design of the plant only called for 1.0-1.2 x 10^5 tpy of strictly commercial MSW to be processed for recyclables. Some of the commercial waste stream (such as restaurant wastes) was perceived as inherently too "dirty" for this kind of "dirty" MRF (a dirty MRF is a facility that removes recyclables directly from MSW; a "clean" or regular MRF processes source-separated recyclables only). These unprocessible loads were expected to directly by-pass the CRRF into the incinerator. The 40% recovery rate was apparently based on large expected recoveries from yard waste, brush, and C&D, with lesser recovery rates expected from the commercial waste stream (Tonjes and Swanson, 1992; Kluesener, 1994).

The Babylon commercial waste stream was believed to be approximately 1.0 x 10^5 tpy. This meant that the Town had to supply an additional 0.98 x 10^5 tpy of MSW from another source. This condition was the driving force behind the Town's IMA with the Town of North Hempstead (Town of North Hempstead, 1993; Kluesener, 1994).

The IMA essentially gave the Town of Babylon control of the Town of North Hempstead's waste stream. Babylon contracted with Star Recycling to manage North Hempstead's collected residential waste stream. Babylon required North Hempstead to exert its flow control authority, and deliver a minimum of 0.60 x 10^5 tpy of commercial wastes, for processing through the CRRF. The agreement with Solar was adjusted to obligate Solar to provide 0.6 x 10^5 tpy of MSW from other sources ("spot market" wastes). It was thought that tonnages over the 1.0 x 10^5 tpy estimate for Babylon's commercial waste stream and 0.60 x 10^5

tpy North Hempstead estimate would fill the remainder of the plant's capacity (Town of North Hempstead, 1993; Kluesener, 1994; Miner, 1994).

The economics of the deal are confusing. Solar was to be paid a \$31 ton^{-1} tipping fee, and allowed to use the WTE plant at no charge. Babylon was to pay the Solar tipping fee and the \$78 ton^{-1} incinerator tipping fee for the CRRF residuals based upon a \$65 ton^{-1} tipping fee paid by Babylon commercial haulers, and a \$13 ton^{-1} fee paid by businesses (assessed on the basis of 10^5 tons times \$13, prorated by assessed valuations of the commercial properties within the Town). North Hempstead commercial wastes were assessed a \$88 ton^{-1} tipping fee (\$78 plus \$10 for transportation). The Town's economics were based upon the guarantee that the Solar recovery rate meant that the Town only paid the incinerator tipping fee on 60% of the received wastes. The tipping fee of \$31 at the CRRF was meant to act as a magnet for spot market wastes (Tonjes and Swanson, 1992; Town of Hempstead, 1993; Jacob, 1994a; Kluesener, 1994; Miner, 1994).

Solar was counting on the construction of a special mill in Pennslyvania to recycle the large amounts of soiled paper expected to be recovered from the CRRF. The mill was never built, and Solar began to suffer financially -- the construction cost of the plant was \$22 x 10^6, and the Town of Babylon Industrial Development Agency bonds sold by the Town for Solar were to be repaid through tipping fees and sales of recyclables. In addition, there appears to have been some hostility to the CRRF from the local carters, as Babylon began requiring that carters deliver directly to the CRRF, instead of to privately-run transfer stations where recyclables had been recovered from commercial wastes. Solar therefore attracted very little in the way of spot market

wastes. The plant also apparently had difficulty attracting the C&D and other high recyclables content wastes necessary to produce salable recovered materials (Moritsugu, 1994a; Heil, 1994; Kluesener, 1994).

Solar was declared in default in January, 1994, a year after beginning operations (although the plant actually ceased accepting materials in December). Opponents of the plant claim that Solar (and, through a liability chain, now the Town) actually has several barges of paper stored in Philadelphia, and that very little in the way of actually recycled materials were ever created at the CRRF. The CRRF was closed for nine months, until October, 1994, when the bond-holders chose Omni Recycling (a Jamaica Ash and Rubbish subsidiary) to operate the plant for a nine month interim period. Initial operations of the plant under the interim period are as a Materials Recovery Facility (MRF) for source separated recyclables (from the Town of Babylon, and the Town of Huntington -- through Jet's contract with Huntington). American Ref-Fuel of Hempstead is a partner in the interim operation, as, if larger scale operations are resumed, residuals from the CRRF may be disposed at Ref-Fuel (Core, 1994; Heil, 1994; Jacob, 1994c; Kluesener, 1994; Miner, 1994; Moritsugu, 1994b). The Town of Babylon apparently does not intend to use the plant for its original design in the near future (Heil, 1994). There is a small possibility that the Town of Brookhaven will sign a contract to use the plant, in place of announced plans to build its own waste stream processing facility (Moritsugu, 1994c; Heil, 1994). At the end of the interim period, the bond-holders are hopeful of selling the plant to Omni Babylon -- as the Jamaica Ash subsidiary is now called -- although full recovery of its $22 x 10^6 cost is not expected (Jacob, 1994a; Jacob, 1994c).

Solar's operating failure led to a restructuring of the Babylon-North Hempstead agreement. Star managed North Hempstead's commercial wastes, and North Hempstead's residential wastes were delivered to either the Babylon or Huntington incinerator, depending on capacity availability at Babylon (Miner, 1994).

The U.S. Supreme Court decision banning flow control laws completely ended the Babylon-North Hempstead IMA, because of financial concerns on North Hempstead's part. Villages which managed their own wastes in North Hempstead had unsuccessfully challenged flow control in the State court system (1991); and the tipping fee charged by North Hempstead to finance the system ($88 ton^{-1}) was far above market prices. North Hempstead officials believed they had good cause to expect the villages (up to 60% of the Town waste stream) would leave the Town system, using the Carbone decision, and seek cheaper waste management options. Faced with the prospect of little waste flow from North Hempstead, both Babylon and North Hempstead invoked the "Change in Law" provisions in the IMA and ended the relationship (North Hempstead would not have been able to provide the "put" part of the put-or-pay contract, and would have had to "pay" for the non-delivery of the wastes) (Jacob, 1994a; Miner, 1994).

The Carbone decision placed great strains on other aspects of Babylon's waste management structure. The Town required enforcement of its own flow control law to meet its own put-or-pay obligations at the WTE plant. Failure to deliver the more than 1×10^5 tpy of commercial wastes could have cost the Town approximately $8 million per year (the remaining tonnage supplied to the plant comes from villages within the Town, and the residential collection

district). The Town's commercial carters had already challenged the flow control restrictions prior to the Court's decision over the requirement to deliver to the CRRF (Jacob, 1994a; Manfre, 1994a; Manfre, 1994b).

The Town had planned for an unfavorable Supreme Court flow control decision. Within 45 days of the court decision, the Town released a RFP for a commercial waste district. Essentially, the commercial district would be like the residential district -- Town-wide, with no tipping fee for collected wastes. However, the complexity of services required for commercial stops is quite unlike the relative homogeneity of residential collection services. The Town designed the system so that each commercial establishment would receive base services for one cubic yard of wastes per week, at a fixed price. A matrix of additional services was established. The prospective bidders were required to bid on the base services, and on the matrix, with the Town to backcharge each commercial property. At least part of the rationale offered for the district was that it would include implementation of mandatory commercial recycling, as each establishment would also receive a container to separate out recyclable materials (Jacob, 1994b; Manfre, 1994b). In November, 1994, a consortium of small local carters backed by Jamaica Ash and Rubbish (Babylon Source Separation Commercial, Inc. -- BSSCI) was chosen to operate the district (Murray, 1995). Immediately, two lawsuits were filed by local carter and waste management groups challenging the Town's authority to establish the district and its implementation of the district (USA Recycling et al vs. Town of Babylon, NY, et al., 1994; A.A. & M. Carting Service et al vs. Town of Babylon, NY, et al., 1994; Goldstein, 1994; Eisenbud, 1994c).

These plaintiffs were joined by other parties, including business owners claiming that the fee structure established by the Town was grossly inequitable. This perception might have been inflamed because the Town also included costs related to the initial implementation of the district in the first year's bills. In addition, as the Town is collecting these fees through its tax bills, businesses have been asked to change from a system of monthly waste disposal fees to one annual bill -- which, of course, is much larger than any one monthly tariff (although it is not clear that the annual sum of the monthly fees charged by the carters is necessarily less than even the first year's bill from the Town) (Jacob, 1994b; Ain, 1994; Amoroso, 1995).

Finally, Star Recycling (through its parent corporation, ReSource) sued the Town over the procurement process, claiming collusion between Town officials and BSSCI (Moritsugu, 1995a). In reaction to all the litigation, Babylon announced further plans for implementation of the district. The Town is moving forward, but with a proposal to provide the collection services with municipal employees. This plan was to have been implemented in February, 1995, but was delayed due to restraining orders obtained by many of the litigants (Moritsugu, 1995b). Other municipalities with put-or-pay obligations have expressed interest in the outcome of this procurement (Del Col, 1994a; Manfre, 1994a; Ronan, 1994; Swenson, 1994a). In September, 1995, the U.S. Circuit Court found that the restraining orders issued to stop Town implementation of the district were invalid, leaving the Town free to begin operation of the commercial district (A.A. & M. Carting Service et al. vs. Town of Babylon, NY, et al., and USA Recycling , Inc., et al. vs. Town of Babylon, NY, et al. [consolidated cases], 1995). Implementation began in January, 1996, in its BSSCI form (Murray, 1995).

Thus, the convoluted tale begun, partly, to provide a guaranteed waste stream for a WTE plant, led Babylon to become the first Long Island municipality to experiment with a dirty MRF, and has now led the Town to attempt to become the first Long Island municipality to collect source separated recyclables from all its businesses with municipally-contracted crews.

Construction and demolition debris is normally managed through private facilities, although the CRRF formerly processed small amounts of this material (Town of North Hempstead, 1993; Kluesener, 1994).

The Town hopes that daily STOP drop-offs will be offered at the CRRF in the future, replacing STOP days (Kluesener, 1994).

The Town's mandatory recycling laws bring it into compliance with GML-120-aa (Babylon had also received an opinion from NYSDEC that the post-collection recovery of recyclables at the CRRF, as long as it was in addition to mandatory source separation, was compliant with GML-120-aa) (Kluesener, 1994).

Brookhaven

The Town of Brookhaven has the largest land area of any planning unit on Long Island, and is second in population at approximately 410,000, behind Hempstead only (Long Island, 1994). It comprises the center of Suffolk County, from the Sound to the Ocean. Most of the Town is tract housing, built in the 1960s or later (although certain villages, such as Port Jefferson, Patchogue, and Stony Brook, predate the suburban boom). The Town contains the largest areas of undeveloped land left on Long Island, although much development is precluded under the Pine Barrens Protection Act.

Brookhaven instituted residential collection services in 1988 in anticipation of the procurement of a WTE incinerator (which was not built). The Town (exclusive of incorporated villages) was divided into 35 districts. The collection and disposal services are bid upon by local

carting firms. Each household currently receives two MSW and one recyclables collection per week (Tonjes, 1993; Tonjes 1995).

Brookhaven passed a mandatory residential source separation recycling law in 1988, with the institution of the districts. The first material collected was newspapers. The Town now collects newspapers, corrugated cardboard, kraft paper, telephone books, and junk mail in one collection cycle. Its second recyclables collection is for aluminum and ferrous cans, glass containers, aerosol cans, aluminum foil, and HDPE and PET containers. Each collection group is picked up every other week, with the north half of the Town recycling paper while the south half recycles mixed materials (and vice versa the next week). The Town has provided each residence with at least one 20-gallon, red "CURBY" container to store recyclables (paper goods are expected to be placed curbside either in paper bags, or bundled and tied) (Tonjes and Swanson, 1992; Tonjes, 1993; Heil, 1994).

The Town opened its MRF in 1991 to process these materials to market condition. The $\$8 \times 10^6$ facility was considered to be state-of-the-art when it opened, and is still considered to be among the finest in the nation. It relies very heavily on mechanical sorting of containers, unlike the usual hand-picking method of most MRFs. The Town had considered expanding the facility in 1994 so as to allow for expansion of the curbside collection list, and to allow for upgrading of the quality of paper products produced by the MRF. The products the Town hoped to add included: PS and PVC containers, small metal objects such as irons and toasters, waxed paper containers (e.g., milk cartons), aseptic containers (juice boxes), and perhaps textiles and

boxboard. The estimated cost of this work was to be approximately $4 x 10^6. However, the Town was unable to agree on the cost for this expansion with the operator of the MRF. The operator is MRI, a subsidiary of NECRInc. (Tonjes and Swanson, 1992; Tonjes, 1993; Heil, 1994).

In 1995, NECRInc., which formerly was a subsidiary of Wellman Plastics, was purchased by Waste Management, Inc. (the nation's largest waste management-related company). The MRF will be Waste Management's first Long Island operation (Groben, 1995).

The Town currently shares recyclables revenues with MRI at a 80:20 ratio, and pays MRI an operating fee. The fee has a monthly put-or-pay tonnage. Revenues received by the Town in 1994 as its share from the sale of recyclables almost equalled the operating fees paid to MRI (Tonjes, 1993; Heil, 1994; Heil, 1995a). The Town is renegotiating its contract with MRI, in the hopes of seeing a substantial decrease in its operating fees. In return, MRI is seeking license to entice commercial sources of recyclables to the MRF to exploit the unused capacity of the plant. The Town would share in any profits from such arrangements (Groben, 1995; Smith, 1996)

MRI currently uses the following firms as recyclable materials purchasers:

newsprint:	Recycled Fibers
corrugated cardboard:	Recycled Fibers
low-grade paper:	Marcal
ferrous:	AMG Resources
aluminum:	Reynolds
HDPE:	Graham Recycling
PET:	MICON

flint glass:	Central New York Bottle
amber glass:	Central New York Bottle
green glass:	Pennsylvania Cullet
mixed glass:	Town roadway projects

(Smith, 1995).

Other materials are recycled by the Town, other than through its curbside container program. White goods and other bulky metal wastes are also picked up from residents. Bulk iron and aluminum, block polystyrene, and used clothing are also collected at the landfill, as well as waste oil and oil filters (also collected at other locations in the Town). The Town has approximately 100 recycling containers for newspapers and commingled containers at parks, marinas, and railroad stations throughout the Town. Mixed paper is picked up at 17 post offices in the Town. Leaves are composted at Manorville. The Town Highway Department also runs a leaf composting program at Holtsville. This once formidable program, credited with composting as much as 2.5×10^5 cubic yards in 1989, has been reduced by regulatory requirements to a more modest 0.05×10^5 or so cubic yards in 1994. Brush is chipped at the landfill. The Town also collects high grade paper from Town offices (Tonjes, 1993; Heil, 1994; Smith, 1996).

As of January 1, 1996, the Town began a mandatory "Don't Bag It" program for grass clippings. The Town will no longer treat bagged grass clippings as acceptable solid waste. Instead, residents will be asked to do one of three things: leave the clippings on their lawns; home compost the clippings; or use alternate landscaping -- ones that do not produce grass clippings. The alternative available to residents will be to deliver the clippings to the Manorville site, where the grass will be composted with the leaves (Smith, 1995).

The Town recycles its collected bulk metals through Gershow Recycling. Polystyrene is recycled through Tri-County Recycling. Used oil is sold to General Environmental Services. High grade paper is sold to Brookhaven Recycling and Waste (Smith, 1995).

Brookhaven has seen a vast diminishment in its waste stream size due to lower costs for disposal at facilities other than those operated by the Town. The Town currently meets its disposal needs through an IMA with the Town of Hempstead for 2×10^5 tpy of capacity at the Hempstead WTE plant. However, in 1992 the Town issued a proposal request for $0.5 - 1.09 \times 10^5$ tpy for composting-recycling services. This was to provide capacity for the Town when the Town finally stopped landfilling MSW (pursuant to the Landfill Law). The procurement sought a dirty MRF with composting of at least some of the residues from the MRF. A preferred bidder (Star Recycling of Brooklyn, with East End Composting of Calverton as the composting subcontractor) was named in November, 1994. However, the Town has not yet signed a contract in the procurement (as of June, 1996). If implemented, the process could apparently lead to a recycling rate of over 60% for the residential waste stream (inclusive of the current curbside source separation program) (Heil, 1994; Heil 1995a).

One reason that the Town Board has withheld its approval of this project is a competing offer from the current operators of the Babylon CRRF. The Town of Babylon, and Jamaica Ash and Rubbish and its subsidiaries, apparently believe that the CRRF can help Brookhaven achieve its goals without Brookhaven having to make a substantial capital investment ($\$11.9 \times 10^6$,

although State EQBA assistance was apparently expected to decrease the cost) (Heil, 1994; Heil, 1995a).

Construction and demolition debris processing, except for small residential loads, and land-clearing debris processing, except for wood wastes collected by the Highway Department, are accomplished through the private sector. The Town does not have records concerning the size of these industries. However, the Town acceptance of C&D processing residuals at the landfill, has allowed for several large C&D processors to become established within the Town. These processors are known to manage wastes generated outside of the Town (Tonjes, 1993)

The Town did not have any STOP days in 1990 due to insurance difficulties, but two days were held in 1991. The Town opened a permanent STOP facility at the landfill in the summer of 1993, which is open two days a week. The facility is operated by a private contractor. The Town also has approximately 125 locations (including Town offices, village halls, recreation centers, apartment complexes, and businesses) for used household battery collections. The collected batteries are managed as hazardous wastes through the STOP facility (Tonjes, 1993; Smith, 1996).

Brookhaven's recycling ordinances bring it into compliance with GML-120-aa (Tonjes, 1993), although private sector recycling activities have not been enumerated or evaluated (Smith, 1995).

East Hampton

The Town of East Hampton, the eastern end of the South Fork of the Island, and one of the five "East End" Towns, was settled in the 1600s as a seafaring and farming community. It long retained a rural character; over the past thirty years, however, much development has occurred, transforming the Town into a summer resort destination. Its year-round population is approximately 16,000 (approximately equivalent to Southold), and much less than all of the Nassau County planning units (Long Island, 1994). The East End is best characterized as lying beyond the practicial commuting distance to New York; although the growth of on-Long Island commerce has made commutation from the East End somewhat practical in some situations, the distance from New York City has made the East End somewhat immune to surbanization.

East Hampton has one of Long Island's more innovative waste management systems. For one, the Town does not provide collection services for its residents. Each resident is responsible

for arranging to deliver MSW and recyclables to the Town's facilities (as is the case in the other eastern-most Towns of Southampton, Southold, and Shelter Island) (Tonjes and Swanson, 1992; Reeve, 1994)

The centerpiece of East Hampton's waste management system is its nascent food waste composting program. Residents who bring MSW to the landfill themselves are encouraged to separate kitchen scraps and compostable paper from other elements of their MSW. These wastes are then screened by hand for inappropriate items, size reduced, mixed with Town sewage sludge to increase the nitrogen levels of the wastes, and composted indoors in a Town-owned and - operated facility, for 21 - 28 days. The mostly stable product is cured outdoors for approximately 9 - 12 weeks, until it is completely stable. The compost is screened to eliminate over-sized objects, and, at present, given away or used for municipal purposes. The Town was composting 12 tons day^{-1} of source-separated food wastes by mid-1995, and, in other troughs at the facility, was experimentally composting other feedstock mixes (Garnham, 1995).

The Town's recycling program began as a drop-off program in 1986, and has expanded to include residents and businesses that use carting services. Self-haulers are required to achieve large degrees of separation of their MSW to facilitate recycling. The private carters are not required to achieve the same degree of separation, as they deliver bulk loads of wastes. Carters are only required to separate recyclables into paper and container waste streams (Tonjes and Swanson, 1992; Bullock, 1994).

The Town has two drop-off facilities, one at the old Montauk landfill, and the other at the recently closed landfill on Springs-Fireplace Rd. Drop-off users separate their recyclables into: the aforementioned food wastes (composted by the Town); yard wastes (composted by the Town outdoors); clear, brown and green glass (recycled through EWG); tin cans (recycled through Gershow Recycling), aluminum cans (also through Gershow); PET and HDPE containers (recycled through RRT, Inc., and Image Industries, respectively); newspapers (marketed by the Town to various mills); corrugated cardboard (baled and marketed by the Town to various end-users); and mixed paper (baled by the Town and marketed to tissue manufacturers). Mixed containers are marketed through Island Recycling. Tires, waste oil, and used clothing are also accepted. White goods, bulky wastes and abandoned automobiles are also recycled (Bullock, 1994; Garnham, 1995).

The design of the Town's waste management system springs largely from a 1988 study by the Center for the Biology of Natural Systems (Queens College, CUNY), sponsored by the New York State Energy and Research Development Authority. Volunteers were able to recover 80% of all household MSW for (sometimes only theoretical) recycling. The Town has used these results as a rationale for building its \$8.5 x 10^6 recycling/composting center. The Town projects that up to 75% of its waste stream will not need to be disposed when the entire system is operating (Tonjes and Swanson, 1992; Garnham, 1995).

A major challenge facing the Town is the separation of food wastes and soiled paper from the general waste stream, especially by carting services. Some of the local carters have been

described as "reluctant to get with the program" by Supervisor Tony Bullock (Bullock, 1994). Inclusion of the general MSW waste stream into the composting process would complicate the production of salable and acceptable compost, and therefore is not being considered as an acceptable solution by the Town (Garnham, 1995).

A substantial tonnage is recovered through a process that debuted in 1986. A brush/wood chipping operation was solicited for the landfill in East Hampton. The chipping contractor separated soil and other "salvageable" materials from heavy brush, wood stumps, etc. The residue was then chipped to create a wood product. The "salvageables" were sold and the Town used the wood mulch for landfill cover and other public works projects. This chippers have been improved over time, and as of 1995 produce 1-2 inch material (Tonjes and Swanson, 1992; Bullock, 1994; Garnham, 1995).

The Town offers one STOP day per year due to the desire of residents to provide the Town with their hazardous household materials. The Town uses a licensed company, Republic, for this service. Supervisor Bullock described the fees for the day as "absolutely outrageous" (Bullock, 1994).

East Hampton's mandatory recycling law is in compliance with GML-120-aa (Bullock, 1994).

Huntington

The Town of Huntington lies in the northwest corner of Suffolk County. It was predominantly developed after the war; however, some of the North Shore villages were ports of some note in the 1800s. The Town has little developable land remaining. Its population (at approximately 190,000) is similar to that of its neighbor to the south, Babylon (Long Island, 1994).

Huntington has contract bid areas, bid out to private carters, for residential collection services, except for one region in the Village of Huntington (where municipal collection services are provided, including commercial properties), and four incorporated villages in the Town. Two MSW collections, and one recycling collection (paper or containers, alternating weeks) are provided. The district carters are only paid for collection of MSW. They are not charged for disposal at the Town's WTE plant (shared with the Town of Smithtown, and run by Ogden-

Martin). The costs to ultimately dispose of the MSW are charged back to the refuse district, which collects the costs from homeowners through a set amount included in tax bills (Tonjes and Swanson, 1992; Del Col, 1994a; Kearing, 1993; Kearing, 1994; McNulty-Gallo, 1996).

The Town has recycled some material (primarily newspaper) since 1972 when it opened its drop-off recycling center. The program continued at a relatively low tonnages through much of the 1980s (Holzmacher, McLendon and Murrell, 1982; Dvirka and Bartilucci, 1986; McNulty-Gallo, 1996). The Town increased its efforts in July, 1987 to preserve landfill space, by beginning curbside collection of recyclables on a pilot basis. In 1989, the program was expanded Town-wide. By 1994, the Town was collecting newspapers, corrugated cardboard, junk mail, boxboard, metal cans, glass, and "consumer" plastic containers (all resins are collected, although perhaps not recycled). White goods are also picked up curbside by appointment. Waste oil, car batteries, and tires are handled on a drop-off basis. So is PS (pursuant to provisions of the Suffolk County Plastics Ban [Swanson et al., 1993]). The Town also has a great many household battery drop-off sites (at schools, libraries, and other community centers). The commingled, non-paper, non-yard waste recyclables are taken "as is" by Island Recycling for a tipping fee of \$15.00 ton^{-1}. Paper is also marketed through the Island Recycling, The Town is guaranteed a minimum revenue of \$40.00 ton^{-1}, and can receive more depending on market conditions Currently, Island Recycling (a subsidiary of the Jet Sanitation/Jamaica Ash and Rubbish family of companies, and not to be confused with the firm of the same name that operates the Glen Cove transfer station) is processing these recyclables at its facility in Central Islip, although municipally-collected paper is processed at the Babylon CRRF (Tonjes and Swanson, 1992; Dvirka and Bartilucci, 1993;

Kearing, 1993; Kearing, 1994; Del Col, 1994a; Heil, 1994; McNulty-Gallo, 1994; McNulty-Gallo, 1996).

Huntington has had "interesting" experiences with yard wastes. In 1990, the Town had opened a rather extensive (7×10^4 cubic yards) yard waste composting site in the western portion of the Town. In April 1992, the Town decided to close the site, which had accepted grass, leaves, and branches, producing compost and wood chips. This was due to complaints from local businesses, which threatened to leave the Town because of the odors. The Town had shipped some of its excess yard waste to Earth-Gro, in Connecticut. After the site closed, the Town shipped yard waste to Cell 6 in Smithtown for a year (Tonjes and Swanson, 1992; Trent, 1994).

This yard waste management approach was unacceptable to NYSDEC, and so both Huntington and Smithtown made arrangements with a commercial composter located between the WTE plant and the Smithtown landfill. In addition, in 1994 the Town followed the Town of Islip's lead, and established a mandatory "Don't Bag It" program (called the "Just Mow It" program in Huntington) for grass clippings. Under a "Don't Bag It" program, the Town does not accept grass clippings for disposal from homeowners through its collection program. However, some arrangements are generally provided if the homeowner individually delivers the clippings to a disposal location. In Huntington's case, the homeowner is charged \$1.50 bag^{-1} if the clippings are brought to the recycling center. The Town has been pleased with the results of this program (Del Col, 1994a; McNulty-Gallo, 1994; McNulty-Gallo, 1996).

However, the local yard waste composter has experienced difficulties in operating the site to NYSDEC and the Town's satisfaction. Huntington is now once more shipping its compostable yard waste out of Town for processing through Omni Recycling-Babylon (the operating entity of the CRRF -- a related company to the Omni Recycling in Westbury). The Town has, at various steps along the way, tried to interest other municipalities in a trade of available incinerator space for needed yard waste composting capacity. A deal with Southold, in 1993-1994, came close to fruition, but apparently foundered on the costs involved (Nester, 1993; Del Col, 1994b; Wickham, 1994; McNulty-Gallo, 1996).

Residential C&D material is handled through the Smithtown landfill. Commercial C&D is managed through the private sector and through the Town's arrangement with Smithtown for access to the Smithtown landfill. For example, in 1995, 5.7×10^5 yds^3 of commercial C&D from Huntington were disposed there (Trent, 1994; McNulty-Gallo, 1996).

The Town held STOP days from 1985 through 1990 (nine in all). Its permanent STOP site (at the Town Recycling Center in Huntington Station) opened in the Summer, 1992. Disposal of material collected there has cost the Town $\$1 - 2 \times 10^4$ a month. The great expense in operation of this facility has led to cutbacks in its a hours of operation. The 1994 annual disposal budget for the facility was exhausted in June of that year after only six months of operation (Tonjes and Swanson, 1992; Del Col, 1994a).

The Town's recycling laws bring it into accord with GML-120-aa (Dvirka and Bartilucci, 1993).

Islip

The Town of Islip lies between Babylon and Brookhaven on the South Shore of Suffolk County. The Town was intensely suburbanized following World War II, and little developable land remains. It has the second largest population in Suffolk County, and the third largest on Long Island (approximately 300,000) (Long Island, 1994).

Islip became nationally known due to the MOBRO 2000 garbage barge incident in 1987, one of the more prominent events in the nation's waste management consciousness and an event believed to be a catalyst in promulgating widespread, general recycling efforts. The barge was, in fact, not a Town of Islip waste management tool at all. It was the brainchild of several Long Island carters. These carters were, however, reacting to a Town ban of the disposal of commercial wastes at the Town's facilities (Reaven, 1987; Tonjes and Swanson, 1992). This was the result of a space shortage at the Blydenburg landfill (Scully, 1994). Although this incident

caused the Town a great deal of embarrassment, it may not have been the most consequential result of the ban. A longer-term result was the establishment of many illegal C&D processing sites within the Town, which Town and State officials had to cope with for the next five years. It may also be the fate of Islip, together with Oyster Bay, to take "credit" for the creation of Long Island's long-distance garbage hauling businesses, as commercial wastes sought economical disposal sites in the face of shrinking capacities and increasing prices at local venues.

However, the Town has had much more positive press due to other waste management decisions. Among the more notable achievements was the transformation of the Lincoln Avenue incinerator into an automated MRF, and the subsequent construction of a modern recyclables processing facility in 1991 to replace the somewhat jerry-built original MRF. The Town's WRAP (We Recycle America Proudly) program received many kudos in the mid-1980s for its achievements. The Town also constructed one of the largest yard waste composting sites in the nation, and has been able to market the compost produced at the site. The Town also led the region through its "Don't Bag It" home composting/mulching program to minimize municipal processing of yard wastes. Islip also received NYSDEC permission to use processed incinerator ash (the Rolite process) in its landfill closure program, the first permitted application in New York State (Tonjes and Swanson, 1992; Scully, 1994).

Islip has garbage districts to provide residential collection; the districts are bid out to private waste collection firms. The financing of waste management is actually through the Islip Resource Recovery Agency, a public authority. The authority cannot use tax revenues to

supplement its revenues; therefore, the waste management system must fund itself from fees collected from its users. The Town depends upon "excess" revenues produced at the WTE plant to fund other elements of the system which do not create revenues greater than their associated costs (in particular, the MRF and compost site) (Tonjes and Swanson, 1992; Scully, 1994).

The Town is demonstrably proud of its curbside collection program. The WRAP program was the first mandatory recycling program on Long Island, and was the earliest comprehensive (container and paper) program. The Town residential curbside program collects newspaper, corrugated cardboard, and glass, metal, and HDPE and PET plastic containers. The Town's MRF allows the Town to process these materials to market-ready conditions. (Tonjes and Swanson, 1992; Scully, 1994)

In October, 1992, the Town switched from collecting all curbside recyclables each week to alternating weekly collection (ie., paper one week and containers the next). This change was made to improve the quality of the materials produced by the MRF. The Town estimates, that if the capital costs of the MRF are factored in, the costs for curbside collected recyclables processing exceeds \$100 ton^{-1}. The operating costs for the MRF have been rising at least in part because of the structure of the facility's debt service (Scully, 1994). Until the amount of money received by the Town for paper recyclables approached this rate, the facility operated at a large loss. However, current prices for recyclables can even make some officials believe that someday perhaps the entire waste management system can operate at no cost to residents, being funded

entirely by revenues from recyclables, compost, select tipping fees, and electricity from the incinerator (Gannon et al., 1995).

The Town recycles white goods, which are picked up from residences. The Town has also moved forward with waste oil (seven specialized Igloo containers at various locations) and other targeted-material recycling projects (Scully, 1994).

The current MRF was opened in October 1991 and depends upon a combination of trommeling and hand-sorting to separate materials (the Town had used a converted incinerator to process materials for market prior to the construction of the newer facility). Islip chose a sorting system heavily dependent on hand-picking (as opposed to Brookhaven's more automated system) because it promised more flexibility in materials processing. It was thought that this kind of MRF would allow the Town some agility in adjusting to changing recyclables markets. However, because of the generally-noted difficulty on Long Island in reaching out to citizens, the Town has not been able to take advantage of this flexibility. It is considered to be too difficult to adjust the materials collected curbside in response to short-term market shifts (Tonjes and Swanson, 1992; Scully, 1994).

The Town also chose to staff the MRF with municipal employees. This decision has made operations more costly, and has led Town officials to consider privatizing the plant. However, no actions have been taken as of the end of 1995. As noted above, it costs the Town in excess of $\$100\ ton^{-1}$ to process recyclables. In comparison, the Town of Brookhaven, using a private

operator, paid \$25 - \$30 ton^{-1} plus 20% of recycling revenues for its MRF operations in 1994 (plus an estimated \$20 ton^{-1} for capital costs) (Heil, 1994; Scully, 1994; Scully, 1996).

Commissioner Scully, who oversaw the planning and development of the Brookhaven MRF while employed by that Town, noted that the Islip MRF, because of its longer hand-picking process line, can sort paper better than Brookhaven's MRF. Conversely, the more automated Brookhaven MRF is more effective at sorting commingled containers. He therefore sees a congruence of interests between the two Towns, and a potential for future cooperative actions. Existing contracts make realization of this concept very difficult (Scully, 1994; Scully, 1996).

The Town also has what is believed to be the largest municipal yard waste composting facility on the East Coast, located just north of the Town's MacArthur Airport. The site began operations in 1988, when the Town began a separate collection of leaves, brush and bagged grass clippings from the 76,000 residences in the Town's collection district. The service was provided once a week. The site managed over 4×10^5 tons of yard waste from 1988 through 1995, and returned more than $\$0.5 \times 10^6$ in revenues from the sale of finished compost over the same time period (Tonjes and Swanson, 1992; Buckner, 1993; Scully, 1994; Scully, 1996).

Early in its history, however, the site generated odor complaints from the community of Ronkonkoma, to its north. Richard Kessel, Governor Cuomo's ombudsman for Long Island solid waste problems, acted as a neighborhood spokesman as the Town entered into negotiations with NYSDEC to address the permit operating conditions as a means of alleviating the odors. Facing

the imposition of ever-more stringent conditions by NYSDEC at the urging of Kessel, Town officials determined that the handling of bagged grass clippings was becoming, in the words of Commissioner Scully, "more trouble than it was worth" (Brand, 1994; Scully, 1994; Scully, 1996).

The debagging of grass clippings had been agreed upon as the primary cause of the odors. Therefore, in February, 1992, Islip became the first municipality in New York to implement a mandatory "Don't Bag It" program. For this reason, and to save on collection costs, and in agreement with environmentalist organizations which claimed that grass clippings do not have to be removed from lawns if processed properly, the Town instituted its mandatory "Don't Bag It" program. The intent of these programs is to have the residents manage yard wastes, specifically grass clippings, by either leaving the clippings on the lawn to be readsorbed into the soil, or to use home composting. Through a massive public education program, designed to wean residents from the convenience of once-a-week yard waste collections,residents were told that the Town would no longer accept grass clippings set out at the curb (although the Town would accept debagged clippings at the compost site). The Town was able to provide rebates towards the purchase of mulching mowers by lobbying mower manufacturers. The Town's campaign received much public support from the U. S. Environmental Protection Agency, NYSDEC, and environmentalist groups such as the New York Public Interest Research Group, the Sierra Club, and the Environmental Defense Fund. The transition from clipping collection to the "Don't Bag It" program has been called "challenging" (Scully, 1994; Scully, 1996).

The modifications to the operations at the composting site and the removal of the prime odor source have been so successful that the Town is now seeking to process additional volumes of materials. The Town believes that its excess compost capacity could be used in a trade-off with a municipality that had excess MSW disposal capacity available (Yan, 1992; Scully, 1994; Scully, 1996).

In 1992, a "coffee truck" vendor, who worked near the Ronkonkoma train station as part of his route, died. The reported cause of death was aspergilliosis. This is a disease caused by the fungus, Aspergillis fumagatis, which may threaten those with compromised immune systems more than healthier individuals. This fungus is pervasive in the environment, but colony counts typically are higher at composting sites (among other environments). A. fumagatis, as with many fungi and molds, grows well in the dark, or in association with moist, warm air (as in ventillation systems). The vendor's family has sued the Town because of the association between A. fumagatis and compost sites. Their claim is that the compost site has caused an increase in colonies in the region, which poses a general health threat, and was (in particular) responsible for the man's death. This law suit has not been resolved (Rabin, 1992; Scully, 1994; New York State Department of Health, 1994; Scully, 1996).

The New York State Department of Health, in conjunction with the odor complaints about the site, had conducted a study of health symptoms and bioaerosols, with the cooperation of the Town and NYSDEC. The community north of the site was compared to a control community several miles away. When the report was issued, it was seen by both sides in the suit

as validation. The report found some elevation of A. fumagatis counts in connection with composting activities. It also did not correlate any respiratory illness patterns with bioaerosols associated with the composting operations (although correlations were found between ozone levels and ragweed pollen counts -- neither of which are believed to be affected by the composting activities). The study's conclusions did include one suggesting that compost sites, because of their capability to raise the levels of A. fumagatis, not be located in the vicinity of people with depressed or suppressed immune systems. Specifically, the study recommended that compost sites should not be located close to hospitals or nursing homes (New York State Department of Health, 1994; Scully, 1996).

The Town received permission from NYSDEC to experiment with the "Rolite" process for the ash produced at the Town incinerator, in 1990. The process makes a mixture of cement and ash that stabilizes the metals contained in incinerator ash, and produces an aggregate-like product that can be created in any particular particle size. The Rolite product was used as a contouring material for the older sections at the Blydenburg site, and in the methane gas venting layer that is constructed just below the cap of the landfill. Savings from avoiding buying sand for these purposes are estimated at $1 x 10^6. The Town eventually received a BUD (Benefical Use Determination) from NYSDEC, which was the first formal approval of general incinerator ash reuse beyond research and demonstration project status in New York State (Tonjes and Swanson, 1992; Roethel, 1993; Long Island Regional Planning Board, 1993; Scully, 1994; Scully, 1996).

Because of this experiment, the Town was able to take ash from Hempstead for much of 1990, and in 1992 entered into an IMA with Huntington. The agreement was, that in return for using Huntington's ash in the Rolite process, Islip would be able to send MSW to Huntington's incinerator for disposal. This agreement was made on a simple "ton-for-ton" basis. When sufficient ash had been received to complete the experiment, the IMA was adjusted to a "cash-for-trash" basis (Tonjes and Swanson, 1992; Del Col, 1994a; Scully, 1994; Scully, 1996).

Rolite ash is considered to be a "secondary reuse material." Secondary reuse materials are non-traditional recyclables. All of the tons the Town takes credit for were either used by the Town, or sold to demonstrable users or marketers. The secondary reuse materials produced by the Town are compost, ash, crushed glass, and processed C&D (Scully, 1994; Breslin et al., 1993).

The Town reportedly was the first Town on Long Island to hold STOP days, and has continued the practice through the 1990s. A study has been commissioned to plan for a permanent facility. The Town's recycling laws are in compliance with GML-120-aa (Scully, 1994; Scully, 1996).

Riverhead

The Town of Riverhead, in particular, the village of Riverhead, was long the seat of Suffolk County government, until the development in the west of the County led to a shift to Hauppauge in the 1960s. Riverhead straddles the Peconic River, at the head of the Peconic Bay, and was the center for the East End agricultural industry. Although some suburban growth has occurred, it still retains its mostly rural character. The Town is the second largest of the East End Towns in population (approximately 23,000), although, since it lacks much of the tourist attractions of the others, may have the smallest tax base per capita (Long Island, 1994).

Riverhead was the latest Town on Long Island to establish residential garbage districts. The impetus for the change from self-hauling or individual contracts with carters was the Town's contracting with East End Recycling for waste management services (in place of landfilling). The implementation of the districts (accomplished in mid-1993) was more prolonged than expected.

The bid process was marked by a succession of bids rejected by the Town because the Town believed that several bidders had ties to organized crime. It should be noted that Riverhead has shown a consistent concern on this issue. The Town, prior to signing its contract with East End, required East End to change its board of directors and separate itself from Omni Recycling and Jamaica Ash and Rubbish (resulting in a change in name to East End from Omni). Jamaica Ash, at that time, was one of the principal defendants in a civil Racketeering Influenced and Corrupt Organizations (RICO) Act suit brought by the U.S. attorney investigating Long Island carters. Jamaica Ash has since settled the suit, paying a $500,000 fine, and accepting a federal monitor of its activities (Suffolk Life, 1992; Freedman, 1993; Cahill and McCann, 1994).

The Town believes that the garbage districts have been well accepted by its residents. The carters have been very cooperative with the Town. Residents, in the first six months of the program, continued to self-haul a great deal of MSW, but by 1994 were content to allow the carters to provide this service. The greatest problem has been establishing and publicizing procedures for the disposal of large items. The Town provides one day of MSW collection, one day of recyclables collection, and one day of yard waste/bulky item collection per household per week. Businesses still contract with private haulers, or self haul their wastes to the old landfill for transfer (Reeve, 1994).

The Town instituted a drop-off recycling program at the landfill in the late 1980s. The Town collected newspapers, chipboard, tin aluminum, glass, and commingled plastic containers. The Town now collects recyclables curbside as part of the collection districts. The recyclables are

marketed by the Town to Island Recycling. In 1994, the Town was paying \$45 ton^{-1} to Island Recycling to recycle commingled containers (HDPE and PET plastic, glass, aluminum, steel, and bi-metal containers). This cost has sometimes been raised due to contaminants included in the curbside collection program. Therefore, the Town has been emphasizing a more extensive residential education program, including rejecting loads of recyclables separated by the residents, in order to improve the quality of the material collected. The cost to the Town for paper recycling, under a contract signed when paper prices were much lower than they have been from 1994 to 1996, is \$15 ton^{-1}. The Town collects, in separate bags: newspaper; corrugated cardboard and boxboard; and junk mail, low grade paper, magazines, catalogs, and mixed paper. The Town collects the paper recyclables one week, and the commingled containers the next (Tonjes and Swanson, 1992; Reeve, 1994).

The Town also collects yard waste and bulk items for recycling. Yard wastes are composted at the landfill site. (Reeve, 1994)

On June 18, 1993, East End became responsible for the disposal of wastes collected by the Town. Under its contract with the Town, East End is to construct a transfer station at the Town landfill, and manage the Town waste stream in its entirety (Tonjes and Swanson, 1992; Reeve, 1994).

East End has a permit from NYSDEC to construct a MSW composting plant (with front-end recovery of recyclables) in the hamlet of Calverton. East End was the first, and, as of June

1996, only private company to receive a permit from the State for MSW composting. East End will require other participants in the plant to provide the necessary amount of wastes, and so has not yet begun construction of the plant. If the Town of Brookhaven agrees to use the plant, construction should begin shortly thereafter. East End believes that it has learned from the mistakes of other pioneers in the MSW composting business (currently MSW composting plants in the U.S. have had a 50% failure rate), and will be able to successfully produce and market a product from Long Island garbage. Riverhead, as host community for the project, will receive favorable tipping fees at the facility. Curiously, however, its contract does not require East End to actually compost the Town's wastes, only to dispose of them. The Town's wastes would be composted, presumably, only if that is cheaper than off Long Island disposal (Tonjes and Swanson, 1992; Heil, 1994).

East End had anticipated procuring other waste sources by late 1994, and starting construction of its facility. Because it had not, and did not make any improvements to the Town's transfer capabilities at its landfill, East End was technically in default on its contract with the Town. The Town, however, did not move to annul its contract with East End (Heil, 1995a).

The Town, when it closed the landfill in 1993, turned to the private sector to provide disposal of C&D. It no longer accepts large quantities of this material for disposal (Reeve, 1994).

The Town has a permanent STOP facility, located at the landfill site. The facility, run by Chemical Pollution Control, is open Monday through Friday. It accepts hazardous household

wastes, including used oil and batteries. The Town's recycling ordinance brings it into accord with GML-120-aa (Reeve, 1994).

Shelter Island

The Town of Shelter Island, which is an island between the North and South Forks of Long Island, is the smallest in population of all the planning units on Long Island, by a wide margin (approximately 2,000, year-round) (Long Island, 1994). It is predominantly a tourist destination, and has little of either industry or farming. It can be reached from the "mainland" only by boat or ferry.

Shelter Island claims to be the first Town on Long Island to adopt a "pay per bag" fee, in 1994. This system was adopted to pay for the change in MSW management from landfilling on the Island to long-hauling off Long Island. Residents must package the MSW in special bags sold by the Town, and no other MSW is accepted by the Town at its transfer station. The original cost for the bags was $1.50 apiece (but the price(s) have been changed). Three sizes are now available -- large ($3.00), small ($1.50), and mini ($0.75). The Town allows recyclables to be dropped off

at no cost (Sherman, 1994; Sherman, 1995) The intent of this program is two-fold: it assesses the costs for waste disposal on those generating the MSW (although costs are assessed by volume, and disposal is paid for by the Town by the ton); and it encourages separation of recyclables from MSW through financial incentives, by the "no-cost" approach for recyclables disposal.

The Town does not provide any collection services. The majority of residents and businesses self-haul MSW to the transfer station (Sherman, 1994).

The per bag system allows the MSW disposal system to be financed in toto by users, not by general Town taxes, which is important given the high disposal costs borne by the Town (Shelter Island had the misfortune to close its landfill and arrange for off-Long Island waste disposal immediately before the crash in such disposal bids; the Town is now attempting to amend its contract to reflect the much lower disposal costs available at present). The system change has also reduced the waste stream, especially tonnages of MSW requiring disposal. One interesting change may be the result of this system. Weekend home-owners had long requested that the Town provide Sunday hours at the landfill. This was so that these residents could dispose of wastes prior to driving to weekday residences and not have MSW at their Shelter Island homes over the week. Since the per bag system was implemented, few people have been availing themselves of these extended hours of operation. The implication is that the weekend visitors are now self-hauling their trash all the way home. The Town also notes that a few residents are burning MSW in backyard barrels, and some are backyard composting (Sherman, 1994; Sherman, 1995). There may also be an increase in illicit dumping in the woods.

The Town began its drop-off recycling program in the late 1980s. Recyclables now managed by the Town include newspaper, cardboard, glass, HDPE and PET plastics, metal, tires, used oil, and clothing. JLJ Recycling of Brooklyn, the Town's MSW long-hauler, arranges for marketing of the recyclables. The Town pays to have newspaper, cardboard, glass and tires to be recycled, gets paid for its plastics, and is able to recycle the other items on a no-cost basis. The Town composts leaves and grass in a simple windrow system. In addition, the Town has established a "ledge treasures" area, for items too good to discard (but which appear to have no immediate use). They are called ledge treasures for their positioning on the edge of the drop-off area bunkers (in good weather) (Tonjes and Swanson, 1992; Sherman, 1994; Sherman, 1995).

The Town continues to accept C&D at the transfer station. Residents pay a charge based upon an estimate of the volume of material, and the Town then pays Mattituck Sanitiation for disposal (Sherman, 1994).

The Town is planning to refine its transfer station. The MSW disposal area is separated from the recyclables drop-off area. The Town believes that operations could be more efficient, labor costs minimized, and recycling further supported, if all the containers were in the same general area. Start-up of construction was expected in late-1995 or early-1996 (Sherman, 1994; Sherman, 1995).

The Town has a STOP building, staffed by Town workers trained by Chemical Pollution Control (which provides disposal services). The facility is open seven days a week. The Town's mandatory recycling law brings it into compliance with GML-120-aa (Sherman, 1994).

Smithtown

The Town of Smithtown lies on the North Shore, between Huntington and Brookhaven. Except for the core of the village of Smithtown (which is pre-Revolutionary War), the Town was largely developed after World War II. Some development of the Town is still occurring. The population of Smithtown is approximately 110,000 (Long Island, 1994).

Smithtown has municipal residential garbage districts, except in its incorporated villages. The Town initiated a requirement that other Towns on Long Island have followed to control some aspects of its collection contracts. The Town required that carters under contract with the Town paint their trucks orange (other Towns use other colors), and print "Under Contract to the Town of Smithtown," to ensure that all residential wastes from the Town actually were delivered to Town facilities (especially the WTE incinerator it has jointly with Huntington). Commercial wastes within the Town are still managed under private arrangements (Trent, 1994).

Smithtown believes it was the first municipality on Long Island to begin a large scale recycling program. In the early 1970s, the Town collected newspapers on a once-monthly basis from area residences; the program was suspended after six months due to a lack of participation. With funding from New York State, the Town opened its Municipal Services Building (MSB) on January 1, 1978, and re-initiated residential recycling. The facility used magnets and hand-sorting to separate recyclables from the waste stream. A residential drop-off area for paper, steel, aluminum, and clear, brown, and green glass was also created. The Town demonstrated the capability of separating out at least 8% of its waste stream during a three-week test period in 1981. Unfortunately, a methane explosion at the landfill damaged the MSB, and caused the program to be suspended in 1984. The only recycling program that continued at that time was a steel segregation program for commercial carters (Tonjes and Swanson, 1992).

The Town's mandatory source separation recycling program began in 1987. The Town has operated its residential recycling program differently from most other Long Island programs. For one, it has consistently followed a policy of banning materials from the landfill or incinerator to encourage recycling of the material (the Town of Islip has also done this, with corrugated cardboard, and it is the basis of the widespread Don't Bag It programs, as well). Thus, Smithtown stopped accepting corrugated cardboard on September 15, 1988, to encourage the recycling of that material. On January 15, 1990 the Town banned glass, plastic and metal containers from its landfill, and dropped the ban on cardboard (the recycling market for cardboard had collapsed) (Tonjes and Swanson, 1992).

Because of the poor market in recyclables, the Town did not collect newspapers and corrugated cardboard in its curbside program for the months of January through August, 1990. This has also become a standard policy of the Town -- not to collect recyclables for which there is no economically viable market. The Town has been criticized for this, as many observers believe that changing recycling programs confuses participants and diminishes recycling rates for still-collected materials. The Town counters these charges, saying that the changes are not made often, and that it is not good public policy to spend taxpayers' monies to support recycling (Tonjes and Swanson, 1992). Thus, at various times, newspapers, corrugated cardboard, and plastic containers have been added to or deleted from the recycling program (Trent, 1994).

The Town's recycling program, in 1995, consists of the collection of newspaper, corrugated cardboard, and mixed containers (cans, bottles, and HDPE and PET plastic) curbside from residences. The Town has processed at least some of its collected recyclables at the MSB since it restarted collecting recyclables. Operations began on a very simple level; the Town has continued to add equipment and capabilities over the years until it now contains shaker tables, magnets, and picking stations to separate materials, and balers to package the recyclables for market. This makes the MSB a full-service MRF, albeit one constructed piecemeal rather than as a whole, as with Islip and Brookhaven's facilities (Trent, 1994).

In the fall of 1991, the Town banned yard wastes from its disposal facilities, requiring that they be disposed at Productive Recycling. Productive Recycling lost its permit to compost yard wastes because of odor complaints in 1992, and the Town ended its relationship with that site. In

1994 the Towns of Smithtown and Huntington began sending their yard wastes to Ray Schleider, a composting site (Huntington was only sending leaves and brush due to the implementation of its "Don't Bag It" program). This action was required by the Town's landfill permit, which forbade landfilling yard wastes after 1993. (Tonjes and Swanson, 1992; Trent, 1994)

In November, 1994, the Town announced the this facility did not have the capacity to manage yard wastes from both of the Towns. Smithtown signed an agreement with Huntington, whereby Huntington would send Smithtown's leaves to Babylon for further processing. Currently, Quality Resources Corp. of Islip is managing the Town's yard wastes (Heil, 1995b). The Town also relies on its voluntary Don't Bag It program to minimize these wastes.

Although the Town has aggressively used ordinances to make its commercial carters recycle, the Town has not made any efforts to quantify the commercial carters' efforts. The Town's recycling ordinances bring it into compliance with GML-120-aa (Trent, 1994).

Southampton

The Town of Southampton is very similar to the Town of East Hampton, with which it shares the South Fork, except that Southampton is much larger (year-round population of approximately 45,000) (Long Island, 1994). It also was a farming and maritime community, which is now largely transformed into a resort destination. The "Hamptons" have become a greatly desired summer address for the affluent of New York City. Large areas within the Town are still agricultural in nature.

Southampton does not provide any waste collection services to its residents. Residents self-haul wastes, or make individual contracts with carters for collection services. The same applies to businesses. The Town moved in 1995 to join two other East End communities (Shelter Island and Southold) in requiring MSW be disposed through a "pay-per-bag" system for waste disposal. Under this system, the Town only accepts MSW for disposal if it is contained in a

special bag. The bags are sold either directly by the Town, or through distributors around the Town (typically, supermarkets, delis, and gas stations). The intent is to force waste minimization by promoting the realization that each bag of garbage has a cost. Another intent is to increase recyclables separation rates, as there is usually no charge for recyclables drop-off. Southampton has implemented the "typical" type of these programs. Currently, the Town's program is funded by fees collected through the sale of the bags, and through tipping fees charged to carters to use the transfer facilities at the old landfill site (Tonjes and Swanson, 1992; Gilbride, 1994; Town of Southampton, 1994).

However, the Town has restricted its waste management program availability as of December 18, 1995. On that date, the Town closed its landfill (it had been the last MSW landfill operating on Long Island). The Town no longer allows carter access to the Town system; access to Town waste management system will be restricted to residents and small businesses bringing drop-off materials to the Town, either recyclables or the specially bagged MSW. Recyclables and the MSW are accepted at three satellite transfer stations (Hampton Bays, Sag Harbor, and Westhampton) or at the old landfill (North Sea) (Baker, 1995; Baker, 1996).

The Town's drop-off recycling program began in 1987; it is now mandatory for both residents and businesses (Gilbride, 1994).

The Town requires residents using the drop-off facilities to separate recyclables into the following streams: newspaper; corrugated cardboard; mixed paper; green glass; clear glass; brown

glass; PET and HDPE plastic containers; aluminum containers; and tin and bi-metal containers. Carters collecting recyclables from homeowners and businesses are required to separate the materials into: newspaper; corrugated cardboard; mixed paper; and commingled containers (HDPE and PET plastics, glass, and metal containers). The Town has found that the carters are achieving a better compliance rate over time. All carters collect recyclables on Thursdays, with the first and third Thursdays reserved for commingled container collection (Gilbride, 1994).

Because of the rigorous separation program, the Town is able to move recyclables to market at no worse than a no-cost basis. The Town is also increasing its enforcement of separation regulations, despite the risk of decreasing enthusiasm for recycling, to create products with fewer contaminants (Gilbride, 1994).

In 1995, the Town sold or gave recyclables to: Pinnacle (newspaper); Jet Sanitation (newspaper, corrugated cardboard, mixed paper, commingled containers, white goods); EWG (glass); Gershow (newspaper, corrugated cardboard, mixed paper, cans, batteries, white goods); Omni Recycling (commingled containers); Deer Park (white goods); and Oxford (tires). A total of 156 containers (weekly collections at three locations) of clothing were collected for local charities, and 21 drums of hazardous household wastes were disposed in 1995 (Baker, 1996).

The Town ceased accepting C&D in 1986; because of space limitations at the landfill, the Town also began refusing to accept residues from private sector C&D processors, as well (Mathys, 1994). However, the Town now provides C&D disposal services for residents at the

Hampton Bays and North Sea transfer stations. The Town charges \$25 $(yard^3)^{-1}$ for this service (Baker, 1996).

In 1992, the Town opened its permanent Hazardous Household Waste facility, which is open three days a week. The Town is in compliance with GML-120-aa (Gilbride, 1994).

Southold

The Town of Southold makes up the North Fork of Long Island. Until very recently, it was still a community centered around farming and fishing; lately, it is developing a cachet as a summer resort, although not to the extent seen on the South Fork. The Town's population is approximately 20,000 (Long Island, 1994).

Southold does not provide any collection services for its residents. Residents must either haul their wastes to the Town transfer station, or arrange for carting services from a private carter. The same is true for businesses (Tonjes and Swanson, 1992).

Southold believes that it led the way in radically reforming many of the fee bases of waste management systems on the East End. It also claims (as with Shelter Island) to be the first Town to move to a "pay per bag" fee system for unrecyclable MSW. A 13-gallon bag costs $0.75; a 30-

gallon bag costs $1.50; and a 40-gallon bag costs $2.25. The pricing was set to return approximately $70 ton^{-1}, to cover the cost of transporting the wastes. The bags are yellow, and are sold in 30 stores throughout the Town, and at Town Hall (Bunchuck, 1994).

The Town's drop-off recycling program began in the mid-1980s. Recycling is now mandatory, and the Town has stepped up its enforcement of the ordinance. Enforcement efforts are simplified because the Town is able to closely supervise homeowners and businesses that self-haul, as they use the transfer station. (The transfer station is a rather modestly-sized building.) The Town also has been working closely with local carters to improve their compliance as they collect wastes under contract. The carters are charged by weight at the transfer station, not by the bag (Bunchuck, 1994).

The Town of Southold is recycling the following materials through the following recyclers: glass containers (to EWG Recycling); HDPE and PET plastic containers (National Waste Technologies); cans (P&K Scrap); scrap metal and car batteries (Franza's Universal); household batteries (Chemical Pollution Control); newspapers (Pinnacle Industries); corrugated cardboard (Jet Sanitation); mixed paper/junk mail (Marcal Paper); and tires (Oxford Tire). Compost and wood chips were either used for municipal purposes, at the landfill itself, or given away to residents. The Town also collects waste oil for recycling (Bunchuck, 1994).

In 1991, the Town began composting yard wastes and other similar materials. Much of these materials less than 4 inches in diameter was composted. In 1993, the Town bought a tub

grinder, and therefore was able to size reduce all brush and landclearing debris to allow it to be used as wood chips or added to the compost. Prior to the landfill's closure in October, 1993, approximately half the yard waste, etc., was composted. Loss of local, cheap disposal has been an incentive to compost the remaining materials (Tonjes and Swanson, 1992; Bunchuck, 1994).

The Town came close to an agreement with the Town of Huntington to accept yard waste from Huntington in exchange for MSW disposal capacity in Huntington's WTE plant in 1993, but the plan foundered. The Town supervisor, Tom Wickham, was active in seeking an agreement with one of the other Long Island municipalities that has extra MSW disposal capacity; however, no acceptable solution has yet been found (Wickham, 1994).

Several "special" wastes are handled differently. Agricultural wastes are shipped to Pennsylvania, and C&D is transported to George's Sanitiation in Quogue for processing. Cleanfill and woodchips are the only materials placed on the landfill, either for erosion control, or for shaping prior to eventual landfill capping (Bunchuck, 1994).

The Town has a permanent STOP facility, and it is available to residents twice a week. The numbers of barrels disposed by the program has decreased steadily, due not to lesser participation by residents, but rather to greater efficiency in packing the barrels to save money. The Town's recycling ordinances make it compliant with GML-120-aa (Bunchuck, 1994).

Recycling Programs Summary

Municipal recycling programs on Long Island prior to the 1980s consisted of several small-scale, limited collection programs, which were not intended to provide major diversions of wastes from disposal sites. The Town of Islip was the Long Island pioneer in requiring its residents to separate certain materials from the waste stream; as of 1994, all Long Island municipalities have adopted similar ordinances mandating residential and commercial source separation recycling. This may, in part, be due to the New York State law, GML-120-aa, which requires source separation of all materials for which it is economically better to recycle than to dispose; certainly, the desire of residents for municipally-sponsored recycling also played a large role.

All Long Island municipalites recycle certain materials: newspaper, steel and aluminum cans, and glass bottles. All of the municipalities, with the exception of Babylon, collect

corrugated cardboard (although the material is recycled in Babylon if dropped off by the homeowner at a collection site). All of the municipalities, with the exception of Long Beach, recover some portion of yard waste. All of the municipalities, with the exception of Glen Cove and Babylon, require the separation of some form of plastic containers (Babylon does accept drop-off plastics). In addition, many municipalities recycle various other materials. These, as reported to us, are listed in Tables 1-3.

Table 1. Paper Recyclables other than Corrugated Carboard and Newspaper

	Mixed paper Junk Mail	Magazines	Hi-grade	Telephone Books	Kraft	Box-board
Hempstead	x*	x*	x	x*		
Long Beach	x*		x			
North Hempstead	x*	x*				
Oyster Bay	x*		x	x		
Brookhaven	x*	x*	x	x*	x*	
East Hampton	x*					
Huntington	x*					x*
Riverhead	x*	x*				x*
Southampton	x*					
Southold	x*					

* = mandatory source separation

Table 2. Metal Recyclables, other than Containers

	Bulk metals White Goods	Cars	Car Batteries	Household Batteries	Aerosol cans	Aluminum foil
Hempstead	x		x			
Long Beach	x					
North Hempstead	x		x	x		
Oyster Bay	x		x			
Babylon	x		x			
Brookhaven	x		x	x	x*	x*
East Hampton	x	x				
Huntington	x		x	x		
Islip	x					
Riverhead	x					
Shelter Island	x					
Southampton	x		x			
Southold	x		x			

* = mandatory source separation

Table 3. Other Recyclables

Hempstead	waste oil, tires, sewage sludge, wood, mattresses, clamshells, cleanfill
Long Beach	waste oil
North Hempstead	waste oil
Oyster Bay	Christmas trees, C&D, cleanfill, tires
Babylon	waste oil, tires
Brookhaven	waste oil, PS, clothing, oil filters, wood
East Hampton	waste oil, food, tires, clothing, wood
Huntington	waste oil, PS, tires
Islip	waste oil, incinerator ash, C&D
Shelter Island	waste oil, tires, clothing, "ledge treasures"
Southampton	tires, clothing
Southold	waste oil, tires, wood, cleanfill

There are factors which differentiate the programs from one another. One difference is the means by which the paper and container recyclables are prepared for market. Some municipalities have built their own processing facilities (Municipal [or Materials] Recycling [or Recovery] Facilities -- MRFs). Brookhaven, Islip, and Smithtown have full-service versions of these plants; East Hampton, and, to a lesser extent, Oyster Bay, have some processing capabilities. Babylon has a facility that was developed with extensive municipal participation (although it is owned and operated by a private firm). Sanitary District 1 in Hempstead also has its own MRF. Riverhead's contract with East End Recycling calls for the construction of recyclables processing. Other municipalities rely on private facilities.

Collection (for recyclables and other solid waste) is accomplished in one of two means: either through municipally-arranged curbside service, or through the combination of privately-contracted for service or homeowner self-haul, where the municipality plays no role in collection. Considering the residential waste stream, and excluding those villages that provide waste management services, the four Towns of East Hampton, Shelter Island, Southampton, and Southold have chosen not to provide collection services; the remaining municipalities do provide collection services (with Hempstead and Oyster Bay having bought special trucks for recyclables collection). All municipalities providing curbside collection services have issued residents special containers to facillitate the separation of recyclables. Service is provided once a week (although some municipalities collect paper and containers alternating weeks). When considering commercially-generated solid waste, only the Town of Babylon provides comprehensive

collection services; Glen Cove, Hempstead, Huntington and Long Beach provide some form of limited (either in volume or areal extent) commercial collection.

Waste reduction has become much more prominent over the past several years as a waste management strategy actually used on Long Island. Organized waste reduction efforts in use on are "Pay-per-Bag," "Don't Bag It," and STOP programs. Pay-per-Bag means that disposers are required to buy municipally-provided bags, which are priced according to the volume of wastes these bags hold. This makes the costs of disposable explicit, and dependent on waste generation rates. This kind of program is in use in Shelter Island, Southampton, and Southold. Don't Bag It programs are for yard waste control. The intent is to have the waste generator let grass clippings lie on the lawn, or to compost or mulch them, and to compost (or otherwise self-manage) leaves, branches, and other gardening wastes. Mandatory programs for grass clippings are in place in Brookhaven, Huntington and Islip, where these wastes are no longer considered to be acceptable in the collection programs; these Towns have non-mandatory programs for the other yard wastes. Oyster Bay and Smithtown promote a totally voluntary version of this program. STOP programs are intended to divert hazardous household chemicals (insecticides, pesticides, solvents, oil-based paints and the like) from landfills and incinerators. All municipalities have some form of STOP program, with the exception of Long Beach; Brookhaven, Huntington, Riverhead, Shelter Island, Southampton, and Southold have built permanent facilities to accept these materials; the other municipalities have collection days at temporary locations during the year.

Composting of yard wastes in the 14 municipalities that collect them occurs in two primary forms: either through a municipal site, or through contracts with with the private sector. The division of the municipalites is primarily geographical, with Islip and Brookhaven, and the East End Towns operating outdoor yard waste composting sites (Huntington and Oyster Bay had composting sites earlier this decade, as well).

Several municipalities are investigating composting materials beyond yard wastes, and one municipality, East Hampton, has actually begun to do so. East Hampton is currently composting source separated food wastes in an enclosed composting facility. Riverhead has signed a contract with East End Recycling which calls for the construction of an MSW composting facility; East End, through a subcontract with Star Recycling, has been identified as a potential MSW composter for Brookhaven (although this procurement appears to be stalled).

Another innovation in recycling on Long Island is the use of "dirty" MRFs. These are facilities which extract recyclables from the general waste stream. The Babylon Commercial and Residential Recycling Facility (CRRF) operated for approximately one year, receiving commercial MSW generated in Babylon and North Hempstead. However, this facility failed. Over the same time period, and for approximately half a year more, North Hempstead used Star Recycling's facilty in Brooklyn for the same purpose (first on the Town's residential waste stream, and, following the closure of the CRRF, on the Town's commercial waste stream). Costs and the changed legal environment following the U.S. Supreme Court Carbone decision ended that relationship. The Town of Brookhaven is involved in a long procurement process for a dirty

MRF, partly to generate compostable materials (see just above); Long Beach is hopeful that its new incinerator operator will deliver a front-end processor for the plant to remove additional recyclables from the waste stream; and the new owners of the Babylon CRRF may once again accept materials other than source separated recyclables.

The Carbone decision continues to affect Long Island waste management. The Town of Babylon's commercial recycling program, for example, is an off-spring of this decision. Babylon, in order to ensure waste flows to its WTE incinerator with its flow control statute declared invalid, created a collection district for its commercially-generated wastes. This bid district disenfranchised the private carters who were not part of the consortium that won the bid. It also led to litigation, which delayed the onset of the district by over a year.

Out of this process, however, came a comprehensive municipal effort to collect commercially-generated recyclables. Because a clause of GML-120-aa forbids governmental interference with pre-established private recycling enterprises, there has been some competition for the recyclables in the Town (and some allegations of recyclables collection being used to circumvent the districting concept). The full impact of Town collection of recyclables cannot be assessed yet; nonetheless, other municipalities, especially those with facilities where waste flows may also be at risk from the Carbone decision, are carefully observing the experiment.

The lack of an ability to establish flow control has certainly played a role in slowing Oyster Bay's waste planning process, including how and/or whether the Town's recycling program will be

developed. Flow control questions also appear to be a factor in the lack of progress by Brookhaven in its development of its Dirty MRF-Solid Waste Composting procurement. Flow control is also an element in the lack of construction activity at the permitted East End Recycling MSW composting plant in Calverton. It may be that the certain paucity of recycling facility expansions or constructions by municipalities is due to the uncertainty involved in solid waste projects, where financing will be supported by revenues from (now uncertain) waste flows. That waste flows apparently can be legally bound by contracts, including those contracts developed from district bid processes, does not appear to have been sufficient consolation for the loss of legislative flow control. Therefore, until uncertainties are lessened, and waste management practices become fully adapted to the post-Carbone legal environment, the structure of municipally-sponsored recycling on Long Island may remain rather static.

The ten year period from the Mobro 2000 was certainly not static, however. Immense programmatic changes in Long Island's recyclables management occurred. Long Island's municipal recycling efforts, beginning in 1986 with two or three voluntary drop-off programs, and one mandatory curbside program, with limited types of materials accepted, processed, and, perhaps, marketed, have certainly advanced tremendously. That these programs are "matter of fact" parts of homeowners expected waste management services is a tribute to the growth of the programs.

This report has described the major changes in municipal strategies fpr recycling. Reports to follow will attempt to enumerate the impact of these recycling programs on the waste stream,

describe recycling activites occurring outside of the municipal sector, and evaluate recovery and waste diversion programs in general in light of the New York State goal of 50% waste diversion by 1997.

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