Integrated Solid Waste Management: The Long Island Experience

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BACKGROUND OF THE INTEGRATED APPROACH

Compatibility of Materials and Energy Recovery:

Following two (2) years of study and research, the concept of integrating energy and secondary materials recovery as part of solid waste management planning was first introduced in the United States at the 1984 ASME Solid Waste Processing Conference.[1] The concept evolved from technical, environmental and economic evaluations of the potential effects of multi-material recycling on the mass burn waste-to-energy project being implemented in Essex County, New Jersey.

The conclusion that recycling and waste-to-energy were, in fact, compatible served to refocus solid waste management planning away from the burn-and-bury versus recycle debate toward an "integrated" resource recovery approach involving materials and energy recovery which maximizes waste volume reduction, overall net energy yield and overall disposal system economics, and minimizes overall program environmental impacts.

The foundation of the study's findings, that recycling and waste-to-energy are compatible, was an in-depth technical analysis which included an assessment of the quantitative and qualitative impacts on the solid waste stream under various recycling scenarios. The cornerstone to the analysis was the information and data available from a comprehensive quantitative and composition study which had been performed as part of Essex County's overall project planning.

Figure 1 presents the study's projected materials composition change over a range of 0-35% (by weight) source separation/recycling scenarios. Figures 2 and 3 present the corresponding projected changes in ultimate analysis and proximate analysis, respectively. Clearly the most significant finding was that the projected fuel (energy) value (Btu/lb) of the net solid waste remaining for energy recovery increased with increased recycling, as shown in Figure 3.

NEW YORK STATE

Solid Waste Management Act of 1988:

In 1980, the New York State Legislature directed the Department of Environmental Conservation (DEC) to prepare a State solid waste management plan and update that plan annually (Chapters 552, Laws of 1980). The first plan was completed in April 1986, and called for a hierarchy of solid waste management alternatives, placing waste reduction and recycling first among the alternatives. The Solid Waste Management Act of 1988 establishes the hierarchy in law.

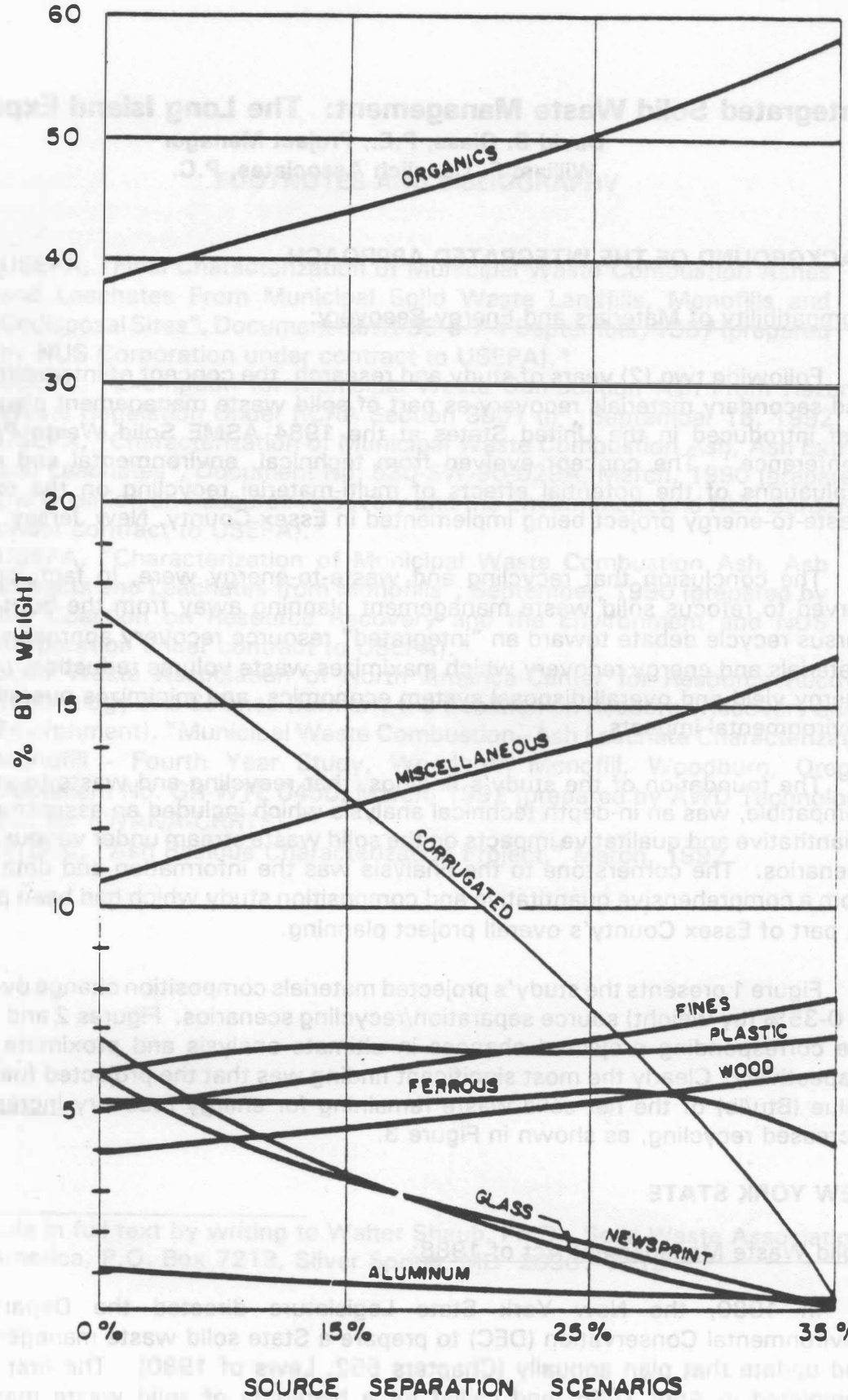
60
50
40
30
20
15
10
5
% BY WEIGHT
ORGANICS
MISCELLANEOUS
CORRUGATED
FINES
PLASTIC
WOOD
FERROUS
GLASS
NEWSPRINT
ALUMINUM
0%
15%
25%
35%
SOURCE SEPARATION SCENARIOS

FIGURE 1

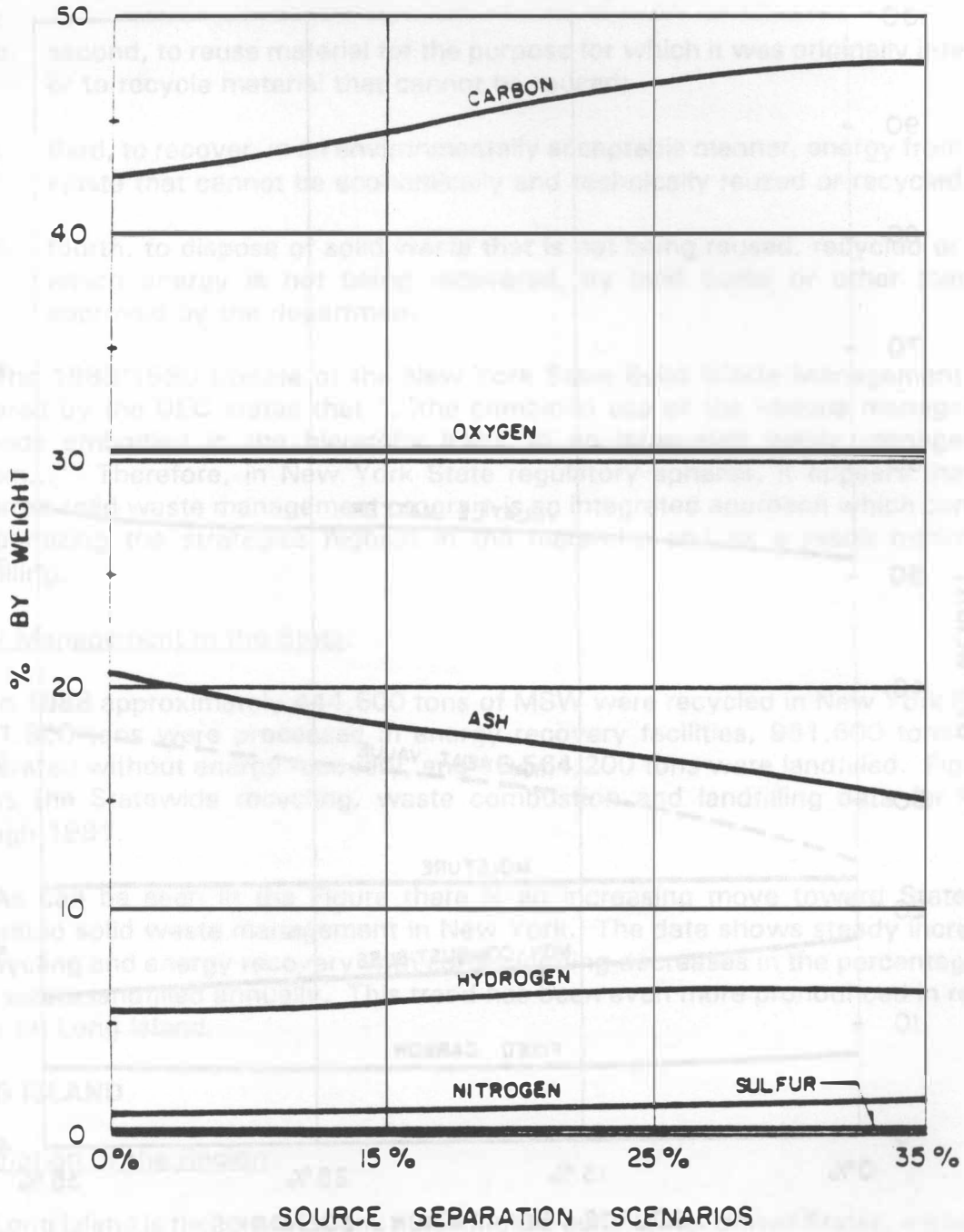
50
40
30
20
10
0
% BY WEIGHT
CARBON
OXYGEN
ASH
HYDROGEN
NITROGEN
SULFUR
0%
15 %
25 %
35 %
SOURCE SEPARATION SCENARIOS

FIGURE 2

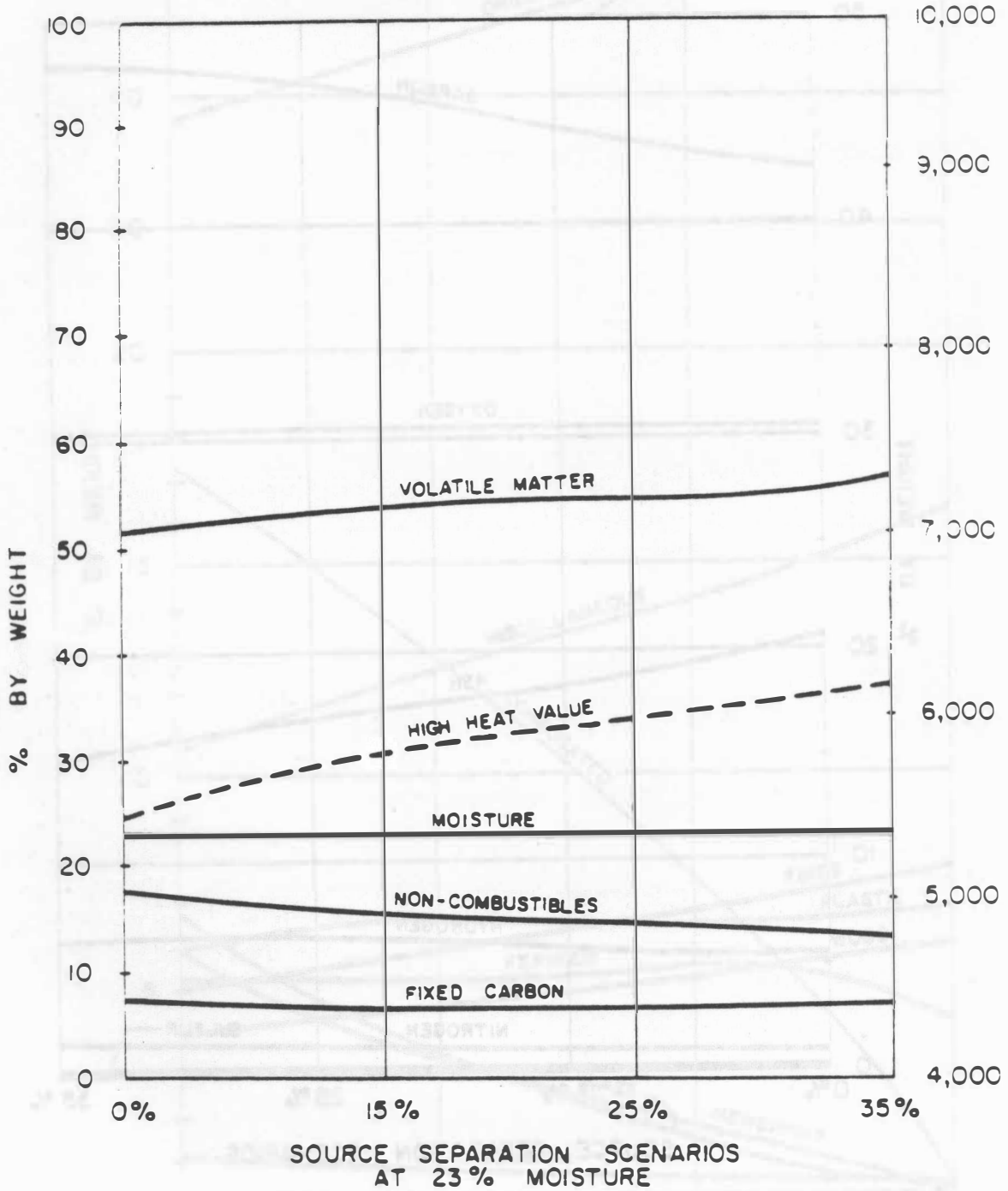
100
90
80
70
60
50
40
30
20
10
0
% BY WEIGHT
10,000
9,000
8,000
7,000
6,000
5,000
4,000
BTU/#
VOLATILE MATTER
HIGH HEAT VALUE
MOISTURE
NON-COMBUSTIBLES
FIXED CARBON
0%
15%
25%
35%
SOURCE SEPARATION SCENARIOS
AT 23% MOISTURE

FIGURE 3

The following are the solid waste management priorities in New York State:

a. first, to reduce the amount of solid waste generated;

b. second, to reuse material for the purpose for which it was originally intended or to recycle material that cannot be reused;

c. third, to recover, in an environmentally acceptable manner, energy from solid waste that cannot be economically and technically reused or recycled; and

d. fourth, to dispose of solid waste that is not being reused, recycled or from which energy is not being recovered, by land burial or other methods approved by the department.

The 1989/1990 Update of the New York State Solid Waste Management Plan prepared by the DEC states that "...the combined use of the various management methods embodied in the hierarchy leads to an integrated waste management system..." Therefore, in New York State regulatory spheres, it appears that the preferred solid waste management program is an integrated approach which consists of optimizing the strategies highest in the hierarchy and as a result minimizing landfilling.

MSW Management in the State:

In 1988 approximately 444,600 tons of MSW were recycled in New York State, 1,571,500 tons were processed in energy recovery facilities, 951,600 tons were incinerated without energy recovery, and 16,564,200 tons were landfilled. Figure 4 shows the Statewide recycling, waste combustion and landfilling data for 1988 through 1991.

As can be seen in the Figure there is an increasing move toward Statewide integrated solid waste management in New York. The data shows steady increases in recycling and energy recovery with corresponding decreases in the percentages of solid waste landfilled annually. This trend has been even more pronounced in recent years on Long Island.

LONG ISLAND

Description of the Region:

Long Island is the largest island adjoining the continental United States, extending approximately 118 miles east-northeast from the mouth of the Hudson River. The island is separated from the mainland on the north by the Long Island Sound and bounded by the Atlantic Ocean on the south and east. Twenty miles at its widest point, Long Island is composed of low plateaus on the north, longitudinal ridges of glacial moraine through the central parts of the island, and gently sloping plains to the south of the moraine.

Figure 4
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Totaling 1,198 square miles of land area, Long Island is divided into two counties: Nassau, and Suffolk. Suffolk County is the larger of the two, covering an expanse of 911 square miles, followed by Nassau with 287 square miles. The population density of Long Island decreases with easterly distance from New York City.

Nassau County, within its three towns, contains 64 incorporated villages while Suffolk, which is geographically over three times larger, contains 30 villages. Two cities, Long Beach and Glen Cove, are situated within Nassau County. At January 1, 1992, the Nassau-Suffolk area is estimated by the region's electric utility company to have a total population of 2,610,679. Nassau and Suffolk Counties make up New York State DEC Region 1. The Region can be divided into the fifteen planning units listed below:

Planning Unit	Population
Town of Babylon	202,646
Town of Brookhaven	412,058
Town of East Hampton	16,236
City of Glen Cove	24,068
Town of Hempstead	725,026
Town of Huntington	190,322
Town of Islip	299,906
City of Long Beach	33,779
Town of North Hempstead	211,426
Town of Oyster Bay	291,436
Town of Riverhead	23,165
Town of Shelter Island	2,269
Town of Smithtown	112,755
Town of South Hampton	45,647
Town of Southold	19,940
Totals	2,610,679

Source: Long Island Lighting Company January 1, 1992 population estimate.

Long Island Landfill Law:

The Long Island Landfill Law, contained in the Environmental Conservation Law 27-0704, which became effective on December 18, 1983 has served to accelerate the move towards integrated solid waste management in Nassau and Suffolk Counties in recent years. The basis for the Law was a 1978 study released by the Long Island Regional Planning Board entitled "The Long Island Comprehensive Waste Treatment Management Plan." In this study, prepared pursuant to Section 208 of the Federal Water Pollution Control Act, eight distinct hydrogeologic zones were assigned to Long Island. The study found that in three of these zones, covering essentially the center of the Island, surface water recharged the deep aquifer through vertical flow paths.

Since this deep aquifer provides drinking water to the vast majority of people on the Island, the study recommend that all solid waste landfills within these "deep-flow" recharge areas be closed and properly capped to reduce infiltration of contaminants. The study also concluded that new solid waste landfills should be prohibited in these deep-flow areas to further minimize degradation of groundwater quality. The study found that outside the deep-flow recharge area, landfilling of solid waste could continue under controlled conditions.

The Law, signed by Governor Mario Cuomo in 1983, incorporated most of the landfilling recommendations of the 1978 study. The goal of the Law is to eliminate, by December 18, 1990, landfilling of all solid waste in the deep-flow recharge areas and to eliminate landfilling of untreated solid waste outside the deep-flow recharge area through the implementation of solid waste treatment systems that reduce the volume and toxicity of the waste.

Certain suggested treatment technologies are specifically identified in the Law, namely: resource recovery (including both materials recovery and energy recovery), incineration (without energy recovery) and composting (both yard waste and mixed solid waste). A municipality would be in compliance with the Law if their waste stream is treated using one or more of these technologies implemented in a manner that reduces the volume and toxicity of the waste stream to the maximum extent practicable. Furthermore, the noncombustible residues, downtime and untreatable waste resulting from the process may be disposed of in a landfill located outside the deep-flow recharge area that is equipped with double-liners and other environmental controls identified in the Law. The Law contemplates that all municipalities on the Island should have a solid waste treatment technology in place by December 18, 1990. However, the Law does allow a limited specific extension to landfill untreated waste beyond the 1990 date to those municipalities that are making all reasonable efforts to implement a solid waste management technology acceptable to the Commissioner, have a double-lined landfill located outside the deep-flow recharge area and meet other specific criteria set forth in the Law.

The manner in which the fifteen Long Island Planning Units have addressed the requirements of the Long Island Landfill Law varies from full compliance to no action at all. However, in general, the Long Island Landfill Law has resulted in decreasing landfilling of raw MSW in several towns, such as Brookhaven and Smithtown, both of which have moved towards more integrated programs since December 1990.

Element of Solid Waste Management Programs:

Presented in Table 1 is a summary of the elements of the solid waste management programs in each of the fifteen planning units on Long Island. The data presented in Table 1, represents information available as of this writing in March 1993. The reader is requested to please note that several municipalities on Long Island share facilities or utilize facilities outside their borders; accordingly, possessing a particular program element (as shown in Table 1) does not necessarily mean the municipality possesses the corresponding type of facility within its borders.

Table 1
Elements of Solid Waste Management Programs for Long Island Planning Units (March 1993)

Planning Unit	Waste to Energy	Materials Recycling	Yard Waste Composting	Landfilling
Town of Babylon	X	X	X	X
Town of Brookhaven	X	X	X	X
Town of Easthampton		X		X
City of Glen Cove	X	X	X	X
Town of Hempstead	X	X	X	X
Town of Huntington	X	X	*	X
Town of Islip	X	X	X	X
City of Long Beach	X	X		X
Town of North Hempstead		X	X	X
Town of Oyster Bay		X	X	X
Town of Riverhead		X	X	X
Town of Shelter Island		X	X	X
Town of Smithtown	X	X	*	X
Town of Southampton		X	X	X
Town of Southold		X	X	X

Note: Based on information available from NYSDEC and municipal sources.

** Program under development.*

As can be seen from Table 1, presently 8 of the fifteen planning units on Long Island utilize a waste-to-energy facility to dispose of some portion of their municipal solid waste. There are currently five (5) operating waste-to-energy facilities on Long Island. These facilities are located in the Towns of Babylon, Hempstead, Huntington and Islip and in the City of Long Beach and represent a combined total capacity of approximately 4,600 tons per day. Brookhaven, Glen Cove and Smithtown utilize waste-to-energy facilities located outside of their borders. A portion of Brookhaven's MSW is transferred to the Hempstead Resource Facility and Smithtown utilizes the Huntington Resource Recovery Facility.

Currently all of the fifteen planning units have municipal materials recycling programs in place. Central materials processing facilities are located in the towns of Babylon, Brookhaven, Islip, North Hempstead and Smithtown. These facilities represent a combined capacity of approximately 2000-3000 tons per day. Capacity at recycling facilities varies with the material mix delivered, the number of operating shifts per day and the length (hours) of each operating shift, among the things.

Table 1 shows that at this writing eleven (11) planning unit municipalities participate in yard waste composting programs. It is important to note that additionally, the Town of Huntington has in the past operated a full-scale in-Town yard waste composting facility and is currently, along with the Town of Smithtown, in the process of reinitiating a yard waste composting program.

A common element to every program in every municipality on Long Island is landfilling. In many municipalities this represents mostly the required disposal of residue remaining after energy recovery, recycling and/or composting. In 1991 an estimated less than 25% of the total waste stream generated on Long Island was landfilled, this is a significant reduction from an estimated 85% in 1988. The reduction is largely the result of increased Islandwide integrated solid waste management.

Town of Brookhaven:

The Town of Brookhaven, with an estimated 1992 population of 412,058, has implemented a unique approach to integrated solid waste management on Long Island. Figure 5 shows the elements of the Town's solid waste management program in 1992. The major components of the Town's program for residential and commercial MSW are a state-of-the-art Materials Recycling Facility (MRF), two Town owned and operated leaf composting sites, the Horseblock Road Landfill, and a Transfer Station utilized to transfer MSW to the Town of Hempstead Resource Recovery Facility.

In 1992, on average approximately 250 tons per day (7 day week) of residential and commercial MSW were disposed in the Horseblock Road Landfill. In 1989, which was prior to operation of the Town's MRF, and utilization of the Hempstead Resource Recovery Facility, an average of approximately 1,100 tons per day of residential and commercial MSW was being landfilled in the Town. Although the decrease may in part be attributed to a slowdown in the economy and rising tip fees at the landfill, in

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TOWN OF BROOKHAVEN, NEW YORK
1992 MUNICIPAL SOLID WASTESTREAM SYSTEM COMPONENTS (TONS PER DAY)

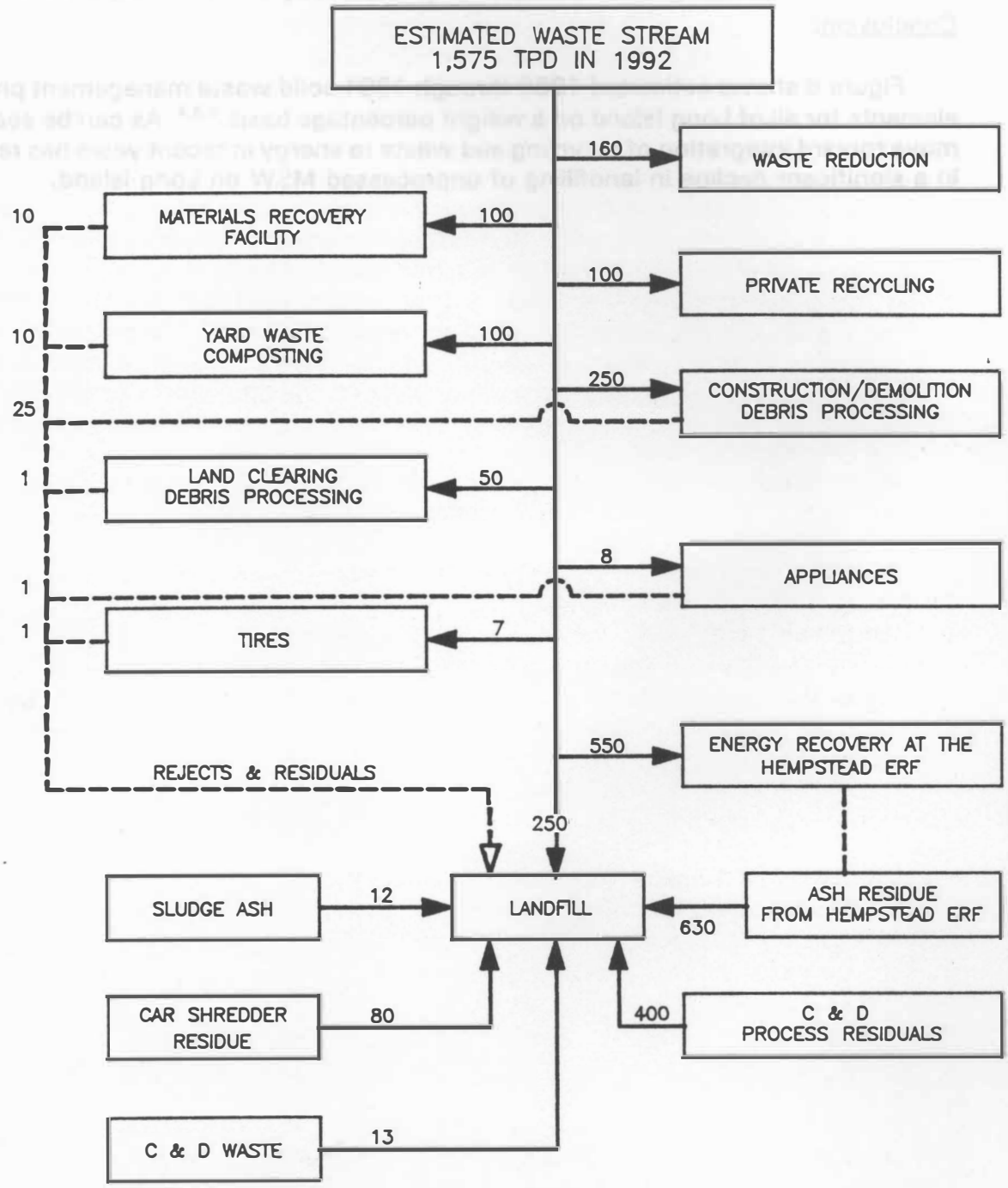

FIGURE 5

1992 upwards of 700 tons per day of MSW (daily average, 7 day week) were diverted to Brookhaven's integrated solid waste management program elements. Additionally, it should be noted that procurement of additional yard waste and solid waste composting capacity for the Town is underway at this writing.

Conclusion:

Figure 6 shows estimated 1988 through 1991 solid waste management program elements for all of Long Island on a weight percentage basis.[2,3,4] As can be seen, the move toward integration of recycling and waste to energy in recent years has resulted in a significant decline in landfilling of unprocessed MSW on Long Island.

Figure 6
This figure will be presented by the author during the conference.