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HOUSEHOLD GARBAGE AND THE ROLE OF PACKAGING

**The United States/Mexico City
Household Refuse Comparison**



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The Solid Waste Council of the Paper Industry
July, 1985

wastes, as well as questions about what foods households currently obtain and how much food households waste.

To assess parts of the processing-packaging technology, this report presents results from a cooperative United States/Mexico City Household Refuse Study. The goal was to compare household refuse from a highly industrialized country, dependent upon food processing and packaging, with household refuse from an industrializing country, less dependent upon processed-packaged foods. Using this USA/Mexico City data base, it is possible to form answers to research questions which concern the relation of packaging to the total quantity of solid wastes households discard, to the quantity of food households "waste," and to the quantity and types of foods households in different income groups acquire.

In the USA, a total of 966 refuse pickups were collected from neighborhoods selected to represent low, middle, and upper income households. In this process, almost 10 tons of garbage from Tucson (Arizona), Milwaukee (Wisconsin), and Marin County (California) were hand-sorted and recorded by students between 1978 and 1981.

In Mexico City, 1084 refuse pickups were drawn from a stratified sample of neighborhoods which also represented low, middle, and upper income households. CECODES, a social science research organization affiliated with the Mexican Government, organized this hand-sort analysis of more than 10 tons of household refuse during 1980 (before the dramatic devaluation of the peso).

In both the USA and Mexico, census data and independent interviews were used to identify the socioeconomic characteristics of the households in sampled neighborhoods. In addition, measures were taken to assure that all refuse remained anonymous.

The differences between Mexico City sample neighborhoods in material possessions is somewhat in contrast to USA sample neighborhoods. While more than 90 percent of homes in all three Mexico City income groups reported owning TVs, only 60 percent reported owning refrigerators in low income neighborhoods. Nearly all USA households have both a TV and a refrigerator.

Both USA and Mexico City sets of refuse samples roughly approximate the income strata of their respective populations (see Table 3 in the report text). Nevertheless, it is important to note that the three Mexico City income groups are not directly equivalent to the three USA income groups. The economic conditions in the lowest income neighborhoods, such as Los Trancas in the Azcapotzalco District of Mexico City, are as equivalent in USA sample neighborhoods. To a lesser degree, the same is true for the elite enclaves at the other end of the spectrum, such as Lomas de Chapultepec, which houses many of Mexico's most influential economic and political leaders. Nevertheless, something new can be learned about both sets of household solid wastes by comparing each to the other in ways which answer questions about the role of packaging in contemporary society.

RESULTS

What is the impact of food packaging on the weight of household solid wastes?

Because of decades of being labeled the "throw-away" society, many Americans feel a little guilty about the quantity of packaging and other materials they throw away. In fact, most probably assume that a heavy garbage can is the price of industrial development. In stark contrast to this viewpoint, the average household in Mexico City discards 40 percent more refuse each day than the average USA household. This difference—1.6 pounds per household per day—is food debris, the skins, rinds, peels, tops, and other inedible parts discarded in food preparation. Because almost all packaging involves some processing, many unused food remains are disposed of in bulk by processing facilities (often as economically useful byproducts, such as fuel or animal feed) before they reach consumers. Thus, USA households, which consume considerably more processed-packaged foods, discard far less food debris and solid waste.

Is food packaging associated with increases or decreases in the amount of edible food in household solid waste?

Food waste in Mexico City household refuse is more than 1000 tons (worth about one million dollars) each year. Large quantities of fresh produce managed in Mexico City are wasted. Overall, relative to the amount of fresh food consumed, the waste is very conservative. It is noteworthy that the least wasteful households are from the lowest income neighborhoods.

Food waste in USA household refuse is less than in Mexico City—about half as much. This low rate of waste is due to the proportion of processed-packaged foods used by USA households and the low rate at which packaging is discarded. In contrast, fresh produce in USA households is more often wasted than in Mexico City households. Thus, while overall food waste is lower in USA households, the waste is more conservative with fresh foods, and the waste from packaging is a significant portion.

Do households of different income levels follow different patterns of food acquisition, and are these patterns related to food waste?

In both Mexico City and the USA, income makes a difference in what people eat. In Mexico, upper income households are "heavy consumers," buying more of both staple foods and exotic foods than lower income households. In the USA, income differences have a smaller effect. Higher income households buy larger quantities of exotic foods, but lower income households buy larger quantities of staples. Also, the overall pattern of the diet is similar for all USA income groups and for all Mexico City income groups.

among all income groups, especially the lowest, in Mexico City. As the Mexico Garbage Project report¹ states: "In a sense, it is not access to basic foods which distinguishes rich and poor in Mexico City, rather it is access to those items which (1) add extra interest to meals, (2) imbue a household with a sense of status, or (3) ease a housewife's chores" (trans. from Spanish). Part of this USA/Mexico contrast in income and food is a result of the role processing and packaging play in reducing fluctuations in price, fluctuations in seasonal availability, and the shortages of various types which can plague extremely large cities.

All in all, in the USA, packaging plays an important role in reducing food debris in household solid wastes, in minimizing food waste, and in increasing the availability of a wide range of foods to all income groups.

IMPLICATIONS FOR MEXICO.

Even in the face of a substantial "devaluation," Mexico is continuing a determined process of industrialization. Change is certain; the question is a matter of what directions it will take. Refuse data have implications for directions of the future.

One repeating pattern in industrializing countries is migration from rural to urban environments (Mexico City in 1985 is well over 17 million people). With this move comes a loss of access to the variety of home-grown produce and a dependence upon markets and stores for access to both basic and exotic foods. In this type of situation, seasonal shifts in price and availability, as well as difficulties with transport and storage, can mean severe problems for low income populations. In fact, Mexico City has known shortages of staples, such as milk, which affect everyone—not just the poor. Higher rates of processing and packaging increase the consistency, variety, and availability of food commodities. This is one reason why some of Mexico City's upper income families actually do some of their food shopping in the United States.

As anthropologists have long noted, another attraction of packaged foods in rapidly industrializing countries is that they are seen as "prestige" status markers. This is one explanation for the high consumption of canned vegetables and fruits among the upper income, who have easy access to fresh produce. The positive image of packaged foods is demonstrated by the canned goods and processed snack foods which are found in all households in Mexico City, even the poorest. Thus, in Mexico, food technology—in the form of processing and packaging—is likely to become ever more important in increasing the access of all economic groups to a greater variety of foods with a greater consistency of cost and quality.

Today, the rate of food waste in Mexico City households is low, but that may change as industrialization accelerates. The highest levels in the social strata are already beginning to see the added "convenience" of

¹Restrepo, L. D.A. Phillips, Jr., and M.D. Reilly, 1982, *La Basura Consumo y Desperdicio en el Distrito Federal*. Instituto Nacional del Consumidor, Mexico, D.F.

replacing fresh with packaged foods. As they adopt more packaged foods, Mexico City residents are likely to experience USA-style problems in the management of fresh produce. As more people have less time to devote to daily shopping excursions and to managing fresh food preparation and storage at home, food waste could grow. However, increased packaging of foods would help to offset this trend. The advantage of packaged food is already clear in upper income households. While they use double the packaged foods of other groups, they discard *no more food waste*.

Because packaged foods are recognized by all income groups as desired "prestige" goods, an increasing number of packaged foods are likely to be purchased if they are available. Exchanging fresh for processed-packaged food is a multi-faceted trade-off. The trend toward increased consumption of packaged foods will decrease the staggering quantity of both food preparation remains and food waste in refuse from Mexico City households at all income levels.

IMPLICATIONS FOR THE UNITED STATES.

It is ironic that as the citizens of Mexico City covet the convenience, availability, and consistency of processed-packaged foods, there is a growing trend among USA consumers to purchase more fresh food. The efficient management (in meal planning, storage, preparation, and use of leftovers) of fresh produce is much more complicated and time-consuming than for processed foods; and with more people working outside the home, there is less time for careful food management. The end result is that the rate of fresh produce waste is currently ten times higher in households in the USA than in Mexico City. The purchase of greater quantities of fresh produce is likely to lead to substantially greater quantities of food waste, unless a national conservation ethic can be developed that would lead to more careful management of fresh produce.

* * *

Overall, the most important message of this report is that household solid waste is a complex problem affected by social, economic, and food-management behaviors. Only by understanding how items such as packaging—which quickly become solid waste—relate to resource management strategies within households, can decision-makers choose proper options for managing solid wastes efficiently today and planning for tomorrow.

plastics: the energy saver

A summary report of an energy
impact analysis of the manufacture
and use of plastics products and
equivalent products made from
non-plastics alternative materials

Prepared for
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by



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1981

Copies of this report are available from
the Literature Department of SPI.

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Preface

This report summarizes the findings of a detailed, comparative energy requirement analysis for the manufacture and use of plastics products and equivalent products made of non-plastics alternative materials. The analysis covers twelve major plastics resins as used in over 260 markets.

The purpose of this report is not to denigrate other materials but rather to place the energy question in proper perspective.

Franklin Associates, Ltd., undertook the study as a project for The Society of the Plastics Industry, Inc., to determine the relative quantity of energy required for the manufacture and use of plastics products compared to non-plastics alternative products. The overall objective of the comparison was to determine whether the current uses for plastics resins result in energy conservation or excessive use of energy.

In conducting the comparative research, Franklin Associates made every effort to obtain the most recent and accurate data regarding products, markets and manufacturing processes. To validate the study, preliminary drafts of the findings were reviewed by plastics industry members to determine the accuracy of such data as market size and composition, raw material and processing energy requirements, and the rationale of using certain selected alternative materials in the event that plastics were not available.

Further validation was made by an independent academic researcher who critiqued the approach and methodology followed by Franklin Associates in carrying out the research and developing the findings.

Both of these reviews concluded that the basic approach as well as the various assumptions made in performing the analysis are reasonable and logical within the known facts in the field.

The complete Franklin Associates study, entitled "Total Energy Impacts of the Use of Plastics Products in the United States," is available in a comprehensive two-volume report. The full report includes details of the research methodology, a full summary of the results and all the data bases used to calculate energy requirements.

The project was carried out under the general direction of Robert G. Hunt, with William L. Bider serving as project leader.

Franklin Associates, Ltd.
1981

Introduction

In the past quarter century the use of plastics has grown from a relatively limited number of selected special products to widespread use in hundreds of thousands of products. From 1953 to 1978, production of plastics resins for domestic and export consumption grew from three billion pounds per year to nearly 38 billion pounds.

Plastics differ from most other major materials in that they not only require energy to process the raw material into finished products, but also require a form of energy (oil and natural gas) as their raw material. In this period of increased public concern for energy conservation, questions have arisen about the use of plastics products if products of alternative materials could provide equivalent service.

The energy requirements associated with alternative products are, however, much more complex than raw material requirements alone. The amount of energy needed to extract, harvest, transport, refine and process the various raw materials differs, often significantly. To compare equivalent alternative materials, a detailed energy analysis is necessary which considers energy consumption for all segments of a total industrial system.

To determine whether current products made of plastics resins are an efficient use of energy, Franklin Associates examined the energy requirements for plastics compared to non-plastics alternatives.

The analysis includes a detailed study of the 12 major plastics resins, accounting for 82 percent of the 34 billion pounds of plastics resins consumed domestically in 1978, the most recent year for which complete data were available at the time of the study. Two hundred and sixty-four plastics markets were identified and the amount of resin consumed by each market calculated in millions of pounds. Alternative materials were identified for each market according to histori-

cal and current patterns of consumption and the amounts of materials used in each market calculated. In most cases, it was assumed that more than one alternative material would be substituted for the plastics.

Of the nearly 28 billion pounds of resin studied, 7.5 percent (or 2.1 billion pounds) were included in the non-specific category of "other" markets because of lack of sufficient market information. The alternative material requirements for these "other" markets were estimated on the basis of the average alternative material requirements for the identified markets.

Energy requirements were identified for the manufacture of the plastics products and for the products of alternative materials. Determination of energy used included fabrication of the final product. A direct comparison of these findings was then made for each specific market and for the total of all markets to determine the energy differential between the use of plastics and non-plastics alternative materials in producing products. The energy involved in transporting these finished products to their markets was beyond the scope of this study because of the wide variety in distribution systems. However, other studies suggest that plastics frequently provide energy savings during distribution and use because of their light weight.

In eleven product areas where energy consumption is involved during the service life of the product, a systems analysis was conducted to quantify the relative performance of the plastics and non-plastics alternatives.

Energy consumption of plastics resins and alternative materials was calculated in British Thermal Units (Btu) for comparison purposes. In addition to the total energy consumption figure, separate calculations were made for consumption of each of the following

energy sources: hydrocarbons, coal, hydropower, nuclear and wood.

In general, plastics products consume little, if any, wood-derived fuel, while some alternative products, such as paper, use significant quantities of wood as an energy source. The question of whether wood-derived energy should be considered equally with other energy sources has been debated by researchers for the past decade. In this study the energy impact has been calculated to show the results with and without wood-derived energy. The tables in this summary report include wood-derived fuel in the total

energy savings figure. The energy savings with wood-derived fuel omitted from the calculations are shown as a footnote in each table.

Considerable effort was made to include comparisons of all plastics markets with alternative materials. However, no realistic non-plastics alternatives could be identified for 10.5 percent of the resin uses. For example, it was judged that there were no realistic alternatives to plastic swimming pool liners and phonograph records. Therefore, the energy consumed in the production of these products was not included in the final determination of total energy savings.

Major findings

The results of this study are presented in terms of net energy savings. These savings are the difference between the quantity of energy consumed in the manufacture of plastics products and that of non-plastics alternative products. Energy values are given in British Thermal Units (Btu) and because of the large quantities of materials and related consumption, all energy is stated in trillion (10^{12}) Btu. For comparison, the energy content of a barrel of oil is 5.8 million Btu and of one ton of coal is 29.2 million Btu.

GENERAL FINDINGS

- For most end-uses, plastics products require less energy to manufacture and use than equivalent products made of alternative materials.
- In the analyses of specific resins or groups of resins, the sum of the energy required for the plastics products was always less than that required for the products made of alternative materials. In other words, when entire resins or groups of similar resins are examined for all end-uses, the energy requirements for using those resins are less than the requirements for using alternative non-plastics products.
- In 1978, if the plastics products analysed in this study had been completely replaced by the selected non-plastics alternative products, total energy consumption would have increased by 834.2 trillion Btu.
- Although market conditions and manufacturing technologies continue to change, it is reasonable to expect the same relative energy savings from the use of plastics over non-plastics materials in future years.
- The total energy savings determined in this study are associated with the manufacture and use of 82 percent of the plastics consumed in the United States in 1978. It is believed that the plastics resins not included in this study would show energy savings similar to those of the resins examined and would consequently provide additional energy savings through the use of plastics. However, the results of the study should not be extrapolated to total resin use.

- Plastics products require less energy than non-plastics products in 204 of the 264 markets studied. These 204 markets account for 90 percent of the resins analyzed. Of the 55 markets showing higher energy consumption for the plastics products, 12 showed a difference of less than 10 percent.

In summary, it is apparent that the use of energy resources to manufacture plastics products is justified in relation to national energy conservation priorities. If plastics products were not available, energy consumption would increase substantially.

ENERGY SAVINGS BY RESIN

Table 1 shows energy savings by resin. The five major resin categories, constituting approximately 85 percent of the total resin production in 1978, all show an energy savings of over 100 trillion Btu over non-plastics alternatives. The total energy savings in these same five resin categories amounted to 688 trillion Btu or 82.4 percent of the energy savings achieved in the twelve resin categories studied.

Beginning on page 12 each of the resins or resin groups is examined separately.

ENERGY SAVINGS BY SOURCE

Consumption of each of the basic energy sources would increase if plastics were replaced by non-plastics alternatives (Table 2). However, the increase would vary considerably for each source.

Of the fossil fuels, coal leads in savings. Coal consumption is significantly less for the plastics products than for the non-plastics alternatives; 547 trillion Btu of coal are saved by the use of these plastics.

Significant savings in the other fossil fuels (the hydrocarbons) also result from the use of plastics products. Natural gas and petroleum comprise the hydrocarbon category and are presented as a single value in the summarized results of this study for a net savings of 153.8 trillion Btu. On the basis of the energy sources for the material production and processing

assumed in this analysis, the energy saving for natural gas is 186.4 trillion Btu; petroleum shows an increased consumption of 32.6 trillion Btu in the manufacture of the plastics products compared to the non-plastics alternatives. Both ethylene and propylene, major plastics feedstocks, are commonly derived from both natural gas and petroleum.

Some hydropower and nuclear energy is conserved by the use of plastics because less electricity is required for the plastics than for the selected alternatives. Substantially less wood-derived fuel is used

for plastics products because paper products, which are a major plastics alternative, use significant quantities of wood wastes as an energy source.

The overall energy saved in the production of these plastics results from the fact that the industrial processes which convert oil and natural gas into plastics use much less energy than the processes which convert mineral ores and other resources into non-plastics alternative products. When this processing energy for plastics products is added to the energy content of the plastics raw materials, the total is still less than the processing energy alone for the alternative products.

Table 1
Energy savings by resin, 1978

Resin	Total Energy Savings Trillion (10 ¹²) Btu	Domestic Resin Consumption Million (10 ⁶) Lbs	Number Markets Analyzed
High density polyethylene	159.5	3,674	25
Polystyrene	151.4	3,714	46
PVC	139.9	5,508	46
Polypropylene	123.0	2,684	37
Low density polyethylene	113.9	6,391	38
Polyester	86.6	1,792	23
ABS and SAN	49.8	1,249	23
Nylon	5.4	258	10
Phenolics, Urea, and Melamine	4.7	2,608	16
Total resin studied	834.2 ¹	27,949 ²	284
Other resin		6,315	
Total domestic resin		34,264	

¹ With energy savings from wood-derived fuel omitted this figure would be 733.1 trillion Btu.

² Includes 2,940 million pounds (10.5 percent) of resin for which no non-plastics alternatives were determined.

Source: Franklin Associates, Ltd.

Table 2
Summary of energy use by source, 1978

Comparative energy requirements associated with plastics products
 Produced from twelve major plastics and
 Equivalent products made of alternative materials

Trillion (10¹²) Btu

Energy Consumption¹

	Plastic Products ²	Non-Plastic Alternatives	Energy Savings With Plastics (Net Difference)
Hydrocarbons	970.5	1,124.3	153.8 ³
Coal	153.7	700.7	547.0
Hydropower	13.2	30.3	17.1
Nuclear	30.0	45.2	15.2
Wood	13.9	115.0	101.1
Total	1,181.3	2,015.5	834.2^{4,5}

¹ Energy consumption represents the total energy required to manufacture the products produced from the resin included in the analysis and the non-plastics alternatives to those products.

² No realistic plastics alternatives were identified for 10.5 percent of the resin included in the comparative energy analysis. The energy required to produce these products is not included here.

³ Includes an estimated savings of 188.4 trillion Btu for natural gas and an increased consumption of 32.6 trillion Btu for petroleum.

⁴ Approximately 5.1 percent of the total estimated savings are calculated using service life analyses for 11 specific markets. These analyses account for the energy used in the service life of the products in addition to the energy of manufacture.

⁵ With wood-derived fuel omitted the net difference would be 733.1 trillion Btu.

Source: Franklin Associates, Ltd.

Methodology

The twelve major volume plastics resins were included in this study. The methodology used to determine the energy impacts associated with the manufacture and use of plastics products is based on the three following assumptions:

- All products manufactured from plastics resins perform a necessary service or function and if these products were not made of plastics other materials would be consumed to manufacture equivalent products. (It was found that in 10.5 percent of the plastics usage there is no realistic non-plastics alternative.) Thus, there cannot be an elimination of the energy required to produce plastics products. The energy saving associated with plastics products is, therefore, defined as the difference between the energy consumed for the manufacture of the plastics products and the energy that would be consumed for similar purposes for non-plastics alternatives.
- When several alternatives for each plastics market exist, the relative replacement percentages and the weight equivalents of the alternatives are estimated based upon current market conditions whenever possible. For alternative materials experiencing little or no use in current markets, historical data provide the most accurate measure of energy consumption.
- Within acceptable limits, the energy to fabricate products from a given material is constant per pound of material and the manufacturing processes used to produce a given material are the same regardless of the end-use for the material. Therefore, for most materials included in the analyses, a single set of energy factors was used which quantified energy requirements per 1,000 pounds of fabricated product.

TASKS

The analyses in the study followed a clearly defined procedure. Several tasks were carried out separately

prior to the final comparative energy impact calculations.

TASK 1: Quantification of Resin Markets

The total domestic consumption of plastics resins was identified and quantified in terms of specific end-use markets. Each market was studied carefully to determine the most significant products comprising the market. In most cases end-use applications were fairly straight-forward. For a few cases where markets were broad and where there were several end-uses for the resin, additional research was undertaken to identify the major products consuming most of the resin in those markets.

TASK 2: Identification of Alternative Systems

The markets identified and quantified in Task 1 were examined to determine alternatives to the plastics products. The selection of alternative systems was based upon current and historical use patterns. The weights of all alternative materials were estimated using the best available data. For most markets, alternative systems involved simple replacement of materials. For example, a plastic bottle may be replaced by a glass bottle or a metal can, so it is necessary to consider only the materials system. In other markets the plastics systems and their alternatives are quite different. For disposable diapers, which rely on plastics, the alternative is cloth diapers. Here the total system of each alternative must be analyzed to determine the impact of the use of plastics. All energy consumption in the diaper market must be examined including such things as washing and drying the reusable cloth diaper.

TASK 3: Development of Energy Impact Factors

An energy profile was developed for each of the plastics materials and each of the materials identified as alternatives in Task 2. The energy profile is a set of factors representing the energy consumption per 1,000 pounds of fabricated product. Included in these factors were consumption of the following six basic energy sources: natural gas, petroleum, coal, hydropower, nuclear and wood.

The energy impact factors represent total system energy requirements including the fabrication of the finished products. Energy requirements for transportation are included in the calculated factors up to the point of fabrication.

TASK 4: Calculation of Comparative Requirements

Using the data developed in Tasks 1 through 3, the total energy consumption associated with the manufacture of plastics products and their alternatives was calculated. For most of the markets, the comparative energy analysis involved nothing more than substituting one material for another and determining their respective energy requirements for manufacture. However, a simple materials substitution was not always possible. The analysis of the energy requirements associated with the use of resin for some markets was considerably more complex.

TOTAL SYSTEMS ANALYSIS

Of the 264 markets studied, all except 11 were analyzed using the simple materials substitution approach. For the remaining 11 markets a total systems approach was followed to include energy requirements during the use of the products as well as the manufacture. Overall, 4.9 percent of the plastics resins in the 264 markets studied were included in this total systems approach.

Descriptions of the 11 markets, the resins and the energy assumptions and energy saving or loss are shown in Table 13.

SENSITIVITY OF ENERGY ANALYSIS

The energy impacts in the analyses in this study are based on hundreds of selected material replacements for plastics products. When two or more non-plastics materials are available as alternatives the relative market shares selected for each of the materials is vital in terms of the resultant energy impact for the plastics market. The net energy savings associated with plastics would undoubtedly change if the current market dictated different replacement percentages than those chosen for use in this report.

To test the sensitivity of the method employed, an alternative material was selected which required the least energy as the replacement for plastics in all markets where there is a significant difference in the energy needs of competing materials. This reduced the total energy savings from 834.2 trillion Btu (Table 1), under a realistic market scenario, to 635 trillion Btu under a minimum savings scenario.

However, a complete elimination of these alternative materials is unreasonable, since current alternative market mixes are based on performance needs as well as energy considerations. Therefore, while it is possible that some errors may exist in the derivation of market shares, it is unlikely that any such errors are present to the extent that any of the conclusions are invalid. We believe the development of the non-plastics alternatives for each market is unbiased and that the market shares are accurate to ± 10 percent.

Therefore, for the manufacture of plastics not to yield a major energy savings would require a significant change in available technology, material usage and present day life style.

High density polyethylene (HDPE)

In 1978, just under 3.7 billion pounds of HDPE resin were consumed in the United States. Three major markets accounted for 1.6 billion pounds of the total high density polyethylene consumption. The largest market was household chemical bottles which consumed 601.6 million pounds. The next two largest markets were milk and other food bottles (541 million pounds), and pipe (499 million pounds).

The use of HDPE as compared to non-plastics alternative materials saved 159.5 trillion Btu in 1978. Table 3 shows that four of the 16 major markets each conserved more than 14 trillion Btu. The respective savings were pipe (28 trillion Btu), pails (21 trillion Btu), milk and food bottles (16 trillion Btu), and household chemical bottles (14 trillion Btu).

A systems analysis was conducted for HDPE used to manufacture basecups for polyester beverage containers. The analysis accounted for the entire container system and compared it to a non-refillable glass bottle, which is the historical competition to the plastics bottle system. On the basis of their respective weights, 22 percent of the energy savings was allocated to the HDPE basecup and the balance was assigned to the polyester container.

Table 3
HDPE markets, resin consumption and
total energy savings, 1978

Markets	Resin Consumption MMlb (10 ⁶) lbs.	Energy Savings Trillion (10 ¹²) Btu
16 Major Markets		
Household Chemicals and Personal Care	601.6	14.06
Milk/Food Bottles	541.2	16.25
Pipe	499.4	27.47
Pails	172.5	20.83
Other Blow Molding	133.7	3.32
Other Film	127.6	13.16
Cases, Crates, Totes and Pallets	126.8	4.28
Food Tubes & Containers	119.0	2.90
Wire & Cable	114.4	3.00
Housewares	108.2	6.97
Other Injection Molding	103.9	6.68
Closures & Caps	77.1	1.46
Film Merchandise Bags	61.6	1.90
Toys	56.2	6.44
Tight Head Pails	55.0	0.74
Sheet	55.0	2.69
Subtotal	2,953.2	132.15
8 Additional Markets	246.4	6.04
Subtotal	3,199.6	138.19
1 Systems Analysis	33.0 ¹	2.78
Subtotal	3,232.6	140.97
"Other" Markets	441.4	18.49
TOTAL	3,674.0	159.46²

¹ HDPE consumed for beverage bottle basecaps.

² Includes wood-derived fuel. With energy from wood-derived fuel omitted, this total would be 149.2.

Source: Franklin Associates, Ltd.

Polystyrene (PS)

In 1978, a total of 3.7 billion pounds of polystyrene was consumed in the United States, making it the third largest resin. About 78 percent of the total consumption was for solid polystyrene products and 22 percent for foam markets.

The use of polystyrene as compared to non-plastics alternative materials saved 151 trillion Btu in 1978, the second largest energy savings of all plastics resins. The 15 major markets, each of which consumed over 80 million pounds of polystyrene in 1978, are shown in Table 4. The largest energy savings were for consumer electronics (17 trillion Btu), cassettes and reels (11 trillion Btu), and furniture (8 trillion Btu).

Two systems analyses were conducted for the polystyrene market. One was disposable tumblers where the alternative is reusable glasses. The other market was residential foam insulation used in billets and extruded foam board. For that analysis, the energy to manufacture the insulation material was compared to the energy saved through its use assuming a 30 year lifetime.

Table 4
PS markets, resin consumption and
total energy savings, 1978

Markets	Resin Consumption Million (10 ⁶) lbs.	Energy Savings Trillion (10 ¹²) Btu
15 Major Markets		
Housewares (Other)	193.6	7.92
Rigid Pipe & Closures	180.4	-0.28
Oriented Film & Sheet	176.0	5.72
Vending Portion Cups	176.0	-3.43
Cups & Containers — Foam	132.0	4.66
Toys	129.8	7.76
Building & Construction	125.4	5.13
Stock Food Trays	118.8	0.93
Dairy Containers	110.0	1.66
Furniture	101.2	8.15
Misc. Packaging & Disposables	94.6	1.76
Lids	94.6	-1.56
Other Furniture & Furnishings	92.4	2.26
Cassettes & Reels	90.2	10.66
Other Consumer Elect.	90.2	16.71
Subtotal	1,905.2	68.27
29 Additional Markets	1,260.3	58.06
Subtotal	3,165.5	126.33
2 Systems Analyses	209.3 ¹	11.46
Subtotal	3,374.8	137.81
"Other" Markets	338.6	13.62
TOTAL	3,713.6	151.43²

¹ Includes 85.6 million pounds for tumblers and cocktail glasses and 123.5 million pounds for residential insulation.

² Includes wood-derived fuel. With energy from wood-derived fuel omitted, this total would be 141.1

Source: Franklin Associates, Ltd.

Polyvinyl chloride (PVC)

Of the 5.6 billion pounds of PVC resin consumed in the United States in 1978, nearly 40 percent went for pipe and pipe fittings. Most PVC consumption is concentrated in a few large markets. Among the major markets, in addition to pipe and pipe fittings, are conduit; wire and cable insulation; and flooring.

The use of PVC in 1978 as compared to non-plastics alternative materials saved 140 trillion Btu. The energy savings associated with the use of PVC pipe as well as savings from other major consumers of PVC resin are shown in table 3. In pipe applications it is estimated that an additional savings of 3.05 trillion Btu is achieved from lower energy required for transporting PVC pipe and fittings to market.

Several of the PVC markets show small energy losses. For example, in flooring the alternatives to PVC include ceramic tiles with two to three times longer lifetimes than PVC and linoleum. Both materials are less energy intensive than PVC.

A systems analysis was conducted for PVC window units because of their additional insulation characteristics.

Table 5
PVC markets, resin consumption and
total energy savings, 1978

Markets	Resin Consumption Million (10 ³) lbs.	Energy Savings Trillion (10 ¹²) Btu
16 Major Markets		
Pipe		
Pressure	992.2	41.79
Conduit	426.8	14.70
Sewer	332.4	-0.33
Drain/Waste/Vent	264.0	4.13
Fittings	116.6	11.90
Drain	74.8	-1.20
Other	17.6	0.54
Additional Savings ¹		3.05
Subtotal	2,224.4	74.58
Wire and Cable	400.4	1.38
Flooring	334.4	-5.52
Furniture	231.0	-1.36
Records	211.2	-
Film	180.4	3.80
Upholstery and Seat Covers	180.4	-1.54
Siding and Accessories	149.6	4.99
Surfacing Film	125.4	-1.29
Footwear	112.2	-1.29
Subtotal	4,149.4	77.20
20 Additional Markets	1,091.0	53.66
Subtotal	5,240.4	130.86
1 Systems Analysis	57.2 ²	2.68
"Other" Markets	270.6	6.39
TOTAL	5,568.2	139.93⁴

¹ Energy savings resulting from lower energy required for transporting PVC pipe and fittings to market.

² No alternative materials available for energy savings calculations.

³ PVC consumed for window units.

⁴ Includes wood-derived fuel. With energy from wood-derived fuel omitted, this total would be 128.5

Source: Franklin Associates, Ltd.

Polypropylene (PP)

In 1978, 2.7 billion pounds of polypropylene were consumed in the United States. Nine polypropylene markets each consumed more than 100 million pounds of resin. No markets clearly dominate polypropylene consumption although carpet, upholstery and slipcovers account for a total of 553 million pounds of resin.

The use of polypropylene instead of non-plastics alternative materials saved 123 trillion Btu in 1978. Energy savings for the 12 major polypropylene markets, each of which consume over 70 million pounds of the resin are shown in Table 6. The largest energy savings are from miscellaneous moldings (16 trillion Btu), appliances parts (16 trillion Btu), and food packaging film (12 trillion Btu).

Two systems analyses were conducted in the study of polypropylene. The first was for the disposable syringe market. The alternative to these polypropylene products are reusable glass syringes which require thorough cleaning and sterilization. The second systems analysis was for five separate automotive markets, where the polypropylene contributes to making the vehicles lighter and more fuel efficient. It was assumed that the average new car in 1978 is 41 pounds lighter as a result of using polypropylene to yield a total saving of 3.6 trillion Btu in the service life of the cars.

Table 6
PP markets, resin consumption and
total energy savings, 1978

Markets	Resin Consumption Million (10 ³) lbs.	Energy Savings Trillion (10 ¹²) Btu
12 Major Markets		
Carpet	340.5	6.25
Upholstery & Slipcovers	212.8	0.42
Battery Cases	160.6	9.42
Miscellaneous Injection	129.8	16.04
Indoor/Outdoor Carpet	129.7	-3.33
Rope/Cordage/Twine	129.7	2.89
Food Packaging Film	119.3	12.45
Closures	110.0	1.90
Appliance Parts	103.5	15.58
Housewares	92.4	7.22
Toys & Novelties	81.4	7.13
Containers & Lids — Injection Molded	70.4	6.53
Subtotal	1,610.1	82.60
23 Additional Markets	444.9	22.65
Subtotal	2,125.0	105.25
2 Systems Analyses	463.3 ¹	12.96
Subtotal	2,588.3	118.21
"Other" Markets	105.6	4.77
TOTAL	2,693.9	122.96²

¹ Includes 413.3 million pounds consumed for automotive uses and 50.0 million pounds consumed for disposable syringes.

² Includes wood-derived fuel. With energy savings from wood-derived fuel omitted, this total would be 118.7.

Source: Franklin Associates, Ltd.

Table 7
LDPE markets, resin consumption and
total energy savings, 1978

Markets	Resin Consumption Million (10 ⁶) Lbs	Energy Savings Trillion (10 ¹²) Btu
17 Major Markets		
Trash Bags	1,041.0	0.55
Industrial Liners	398.9	1.58
Wire & Cable	387.4	4.15
Coated Paperboard	362.1	4.94
Baked Goods Packaging Film	331.1	17.40
Produce Film	333.6	-3.62
Industrial Sheeting	224.4	1.15
Textile Packaging Film	182.6	7.38
Housewares	174.3	9.97
Containers and Lids	160.6	13.79
Shrink Wrap, Pallet	134.2	-0.08
Toys & Novelties	129.8	12.58
Meat, Poultry and Seafood Film	125.4	2.39
Other Packaging Film	111.6	2.43
Household Film	110.0	10.14
Retailers Bags	105.6	1.01
Garment Bags	105.6	3.52
Subtotal	4,418.2	89.22
18 Additional Markets	1,025.9	20.19
Subtotal	5,444.1	109.41
3 Systems Analyses	259.6 ¹	-6.45
Subtotal	5,702.7	102.96
"Other" Markets	687.3	10.83
TOTAL	6,391.0	113.89 ²

¹ Includes 129.8 million pounds for agricultural film, 110.0 million pounds for disposable diapers, and 19.8 million pounds for non-woven disposable bed sheets.

² Includes wood-derived fuel. With energy from wood-derived fuel omitted, the total would be 49.4

Source: Franklin Associates, Ltd.

Low density polyethylene (LDPE)

In 1978, nearly 6.4 billion pounds of LDPE resin were consumed in the United States. This amounted to 20 percent of the total domestic consumption of plastics resins. Nearly four billion pounds of the resin consumed was used to make film for 22 LDPE markets.

The use of LDPE as compared to non-plastics alternative materials saved 114 trillion Btu in 1978. Table 7 shows the energy savings in the 17 major markets each of which consumed over 100 million pounds of LDPE resin in 1978. Largest energy savings occurred in baked goods packaging film (17 trillion Btu), containers and lids (14 trillion Btu), and novelties (13 trillion Btu). In the markets under 100 million pounds in volume, film for frozen foods — consuming 85.8 million pounds — showed a saving of 14 trillion Btu.

LDPE is the resin which competes most directly with paper products which utilize significant quantities of wood wastes as fuel. If wood energy is omitted from the calculations the energy savings for plastics compared to the non-plastics alternatives is 49 trillion Btu instead of 114 trillion Btu. However, LDPE is the only resin of the 12 studied in which there is a significant difference between total energy savings and energy savings omitting wood-derived fuel.

In all but three of the LDPE markets studied for energy impacts, a simple materials substitution was sufficient. However, systems analyses were performed for agricultural film, disposable diapers and non-woven disposable bed sheets.

Polyester

A total of 1.8 billion pounds of polyester resins were consumed in the United States in 1978. This includes both the thermosetting polyester (1.2 billion pounds) and the thermoplastic polyesters (0.6 billion pounds).

The analysis of thermosetting polyester was complicated because large quantities of the resin are reinforced with fibers — usually glass. The amount of reinforcement ranges from 20 percent to 75 percent. Since the energy requirements per pound of material differ for different fiber contents, it was necessary to assume an average value for each market.

Use of these resins as compared to non-plastics alternative materials saved 87 trillion Btu in 1978. Table 8 shows the 14 major polyester markets, each of which consumed over 30 million pounds of resin in 1978. The largest energy savings were shown in corrosion resistant products (37 trillion Btu), tanks and pipes (17 trillion Btu), and packaging film (8 trillion Btu).

A systems analysis was done for the blow-molded bottle market. Virtually all of these containers were used to package soft drinks in 1978. The analysis included all the filling and distribution requirements of each container system.

Table 8
Polyester markets, resin consumption
and total energy savings, 1978

Markets	Resin Consumption Million (10 ³) lbs.	Energy Savings Trillion (10 ¹²) Btu
14 Major Markets		
Marine	249.0	1.28
Photographic and Electro-Magnetic Film	249.4	— ¹
Construction	135.0	2.86
Packaging Film	124.6	8.07
Transportation	119.0	1.83
Other Casting	89.0	—0.19
Corrosion Resistant Products	85.0	36.50
Plumbing Fixtures	73.3	—0.59
Consumer	68.0	—1.24
Imitation Marble	60.0	—2.58
Auto Body	50.0	6.37
Gel Coats	46.0	— ¹
Tanks and Pipes	44.7	17.21
Electrical	30.0	—0.14
Subtotal	1,423.0	69.16
8 Additional Markets	81.7	3.40
Subtotal	1,576.3	72.56
1 Systems Analysis	189.2 ²	14.04
Subtotal	1,765.5	86.60
"Other" Markets	104.0	—0.04
TOTAL	1,798.0	86.56 ³

¹ No non-plastic alternatives available for energy savings calculations.

² Resin consumed for soft drink beverage bottles.

³ Includes wood-derived fuel. With energy savings for wood-derived fuel omitted, this figure would be 85.6

Source: Franklin Associates, Ltd.

ABS and SAN

In 1978, 1.1 billion pounds of ABS resin and 100.5 million pounds of SAN resin were consumed in the United States. The two resins were examined collectively because of the similarity of their end-uses. Three markets dominate ABS consumption. They are drain, waste and vent pipe fittings (180 million pounds), appliance components (224 million pounds) and automotive uses (163 million pounds).

The use of ABS and SAN as compared to non-plastics alternative materials saved 50 trillion Btu in 1978. Table 9 shows the savings in major ABS and SAN markets, each of which consumed over 20 million pounds of resin. Drain/waste/vent pipe and fittings produced the largest energy savings at 4 trillion Btu. The two next largest energy savers in the major markets were appliance components (14 trillion Btu) and business machines (6 trillion Btu).

One systems analysis was performed for automobile parts made of ABS resin. When the 163 million pounds of ABS resin was compared with the 377 million pounds of alternative materials there was a total savings of 214 million pounds. This weight savings was equal to 21.5 pounds per car and the fuel savings associated with the light-weighting resulted in a total energy savings of 5 trillion Btu.

Table 9
ABS and SAN markets, resin consumption
and total energy savings, 1978

Markets	Resin Consumption Million (10 ³) lbs.	Energy Savings Trillion (10 ¹²) Btu
14 Major Markets		
Pipe and Pipe Fittings		
Drain/Waste/Vent	180.0	3.61
Plumbing-Recreational Vehicles	47.5	1.35
Plumbing Fixtures	40.0	0.83
Conduit	60.0	-0.30
Sewer	85.9	1.85
Well Casing	20.0	2.71
Pressure	10.5	2.59
Additional Savings ¹	—	0.55
Subtotal, Pipe and Fittings	443.9	13.19
Appliance Components (ABS)	224.4	13.54
Business Machines (ABS)	59.4	5.51
Miscellaneous Recreational Products (ABS)	31.7	1.97
Consumer Electronics (ABS)	30.8	1.85
Modifiers (ABS)	24.2	3.13
Housewares (SAN)	20.0	-0.17
Compounding (SAN)	20.0	—
Subtotal	854.5	39.02
8 Additional Markets	105.1	-0.17
Subtotal	959.6	38.85
1 Systems Analysis	163.03	5.13
Subtotal	1,122.6	43.98
"Other" ABS and SAN Markets	126.7	5.90
TOTAL	1,249.3	49.88 ²

¹ Energy savings resulting from lower energy required for transporting ABS pipe and fittings to market.

² No non-plastics alternatives available for energy savings calculations.

³ ABS consumed for interior and exterior automotive uses.

⁴ Includes wood-derived fuel. With energy savings from wood-derived fuel omitted, this total would be 49.7.

Source: Franklin Associates, Ltd.

Nylon

In 1978, 257.8 million pounds of nylon resin were consumed for non-fiber end-uses. Only the resin used to manufacture these engineering thermoplastics is included in this analysis. The 70 million pounds of nylon resin used for the transportation market is twice as large as the next highest market — consumer products.

The use of nylon as compared to non-plastics alternative materials saved 5.4 trillion Btu in 1978. The 10 major nylon markets listed in Table 10 show that the transportation market produced the largest energy savings at 3 trillion Btu. Other energy-efficient markets include injection molded products for industrial products (1.5 trillion Btu), and appliances (1.4 trillion Btu).

Table 10
Nylon markets, resin consumption and
total energy savings, 1978

Markets	Resin Consumption Million (10³) lbs.	Energy Savings Trillion (10¹²) Btu
10 Major Markets		
Transportation	70.4	3.09
Consumer Products	35.2	-0.08
Electrical/Electronics	30.8	-1.08
Industrial	27.5	1.49
Film	18.7	0.48
Appliances	15.4	1.42
Sheet Rod & Tube	11.2	0.88
Monofilaments	9.9	-0.56
Filaments	9.9	-0.83
Wire & Cable	7.9	0.21
Subtotal	<u>236.9</u>	<u>5.04</u>
"Other" Markets	<u>20.9</u>	<u>0.42</u>
TOTAL	<u>257.8</u>	<u>5.46¹</u>

¹ Includes wood-derived fuel. With energy savings from wood-derived fuel omitted, this total would be 5.39.

Source: Franklin Associates, Ltd.

Phenolics/Urea/Melamine

A total of 2.6 billion pounds of phenolics, urea and melamine resins was consumed in the United States in 1978. The three resins were examined collectively because the end-uses are very similar.

Bonding and adhesives comprised over 75 percent of the total resin consumption. Laminates and coating make up an additional 8.3 percent. These end-uses, comprising 84.3 percent of these three resins, have no non-plastics alternatives. In the 60 years that these end-uses have been in existence no alternatives have been developed which can perform equivalent functions. The energy consumed in the manufacture of resins for these uses, therefore, has been omitted from the alternative material energy analysis.

Overall, a total of 4.7 trillion Btu were saved by using these resins rather than non-plastics alternative materials in 1978. Two major markets — appliances and transportation (non-electrical) saved 2.5 and 2.4 trillion Btu respectively as shown in Table 11. Other markets showed minor energy savings or energy losses.

Table 11
Phenolics/Urea/Melamine markets
resin consumption and total energy savings, 1978

Markets	Resin Consumption Million (10 ⁶) lbs.	Energy Savings Triton (10 ⁹) Btu
16 Major Markets		
Bonding and Adhesives (U-M)	1,003.2	— ¹
Bonding on Adhesive Resin (P)	956.3	— ¹
Electrical/Electronics (P)	140.8	— ¹
Laminating (P)	105.6	— ¹
Textile Treating and Coating (U-M)	61.6	— ¹
Paper Treating and Coating (U-M)	61.6	— ¹
Dinnerware (M)	46.5	—0.43
Electrical (U)	44.8	0.00
Appliances (P)	44.0	2.46
Housewares (P)	39.6	0.18
Transportation — Nonelectrical (P)	26.4	2.40
Transportation — Electrical (P)	19.8	—0.21
Closures (P)	19.8	0.06
Closures (U)	14.5	—0.05
Buttons (M)	3.7	0.03
Sanitary Ware (M)	1.5	0.02
Subtotal	2,589.7	4.46
"Other" P-U-M Markets	16.2	0.25
TOTAL	2,605.9	4.71^{2,3}

¹ No non-plastics alternatives available for energy savings calculations.

² Includes wood-derived fuel, with energy savings from wood-derived fuel omitted, this figure would be 5.5.

³ Total may not equal sum of components due to rounding.

Source: Program Associates, Ltd.

Summary of energy savings by resin

The use of high density polyethylene products results in the most energy conservation of the resins examined in this analysis while phenolics-urea-melamine products show the least savings (Table 1).

Another way of looking at the relative energy savings of each resin is to calculate the energy savings per pound of resin consumed. Table 12 shows the results of this calculation. There is a wide difference in the energy savings per pound of the different resins. Polyester is the most energy efficient resin with an average of 60,230 Btu saved per pound of resin consumed. Melamine is the least energy efficient, consuming 7,550 Btu more than the alternatives per pound.

Overall, these plastics consume an average of 33,360 Btu less energy than the alternatives per pound of resin consumed. This value is equal to approximately 80 percent of the average energy required to manufacture one pound of the resins — including the raw material feedstocks.

Table 12
Energy savings per pound of resin consumed¹
(Btu per pound of resin)

Resin	Total Energy Savings
ABS	43,270
PVC	28,310
Polyester	60,230
Polypropylene	45,600
Polystyrene	40,780
HDPE	43,400
Phenolics	32,830
Nylon	21,180
LDPE	17,820
SAN	2,240
Urea	-940
Melamine	-7,550
Weighted Average	33,360²

¹ Based upon only that resin included in energy analysis (25 billion pounds).

² Includes wood-derived fuel. With energy savings from wood-derived fuel omitted, this total would be 29,310.

Source: Franklin Associates, Ltd.

Plastics market total systems analyses

About 5.1 percent of the total savings in this study were calculated by using a total systems approach which accounts for the manufacture and use of the products rather than just a simple materials replacement. Table 13 lists the 11 markets analyzed in this manner and together with the resins consumed for each market and comparative energy consumption for the plastics system and the non-plastics alternative system.

Table 13

Plastics markets analyzed using systems approach
to determine energy impacts

Resin consumption in million (10⁶) pounds
Energy consumption in trillion (10¹²) Btu

Market	Resin	Resin Consumption (10 ⁶ lb.)	Total Energy Consumption (10 ¹² Btu)		
			Plastics System	Alternative System	Net Difference
Agricultural Film	LDPE	129.8	6.50	1.25	-5.25
Disposable Diapers	LDPE	110.0	42.21	41.59	-0.62
Disposable Film	LDPE	19.8	1.39	0.82	-0.57
Window Units	PVC	57.2	2.22	4.90	2.68
Tumblers/Cocktail Glasses	PS	85.8	3.93	10.97	7.04
Home Insulation	PS	123.5	5.96	10.40	4.44
Bottle Basecaps	HDPE	33.0	4.96	7.74	2.78
Disposable Syringes	PP	50.0	2.52	1.49	-1.03
Automotive	PP	413.3	17.20	31.19	13.99
Automotive	ABS	163.0	8.06	13.19	5.13
Blow-Molded Bottles	Polyester	169.2	18.89	32.93	14.04
Subtotal		1,374.6	113.84	156.47	42.63
All Other Markets		26,571.4	1,067.46	1,859.03	791.6
Total Resin Included in Energy Analysis		27,946.7 ¹	1,181.3	2,015.5	834.2 ²

¹ An additional 2,940 million pounds of resin were examined in terms of end-use. However, no non-plastics alternatives were determined.

² With energy savings from wood-derived fuel omitted, this figure would be 733.1 trillion Btu.

Source: Franklin Associates, Ltd.

Energy savings equivalencies

A total energy savings associated with the use of plastics products included in this analysis was 834 trillion Btu. To illustrate the magnitude of this savings, 834 trillion Btu is equivalent to:

- 75,766 million kilowatt-hours

or

- 28.7 million tons of coal

or

- 142 million barrels of oil

or

- 2,484 million gallons of gasoline

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German government sponsored study

comparing

paper bags and polyethylene bags

Plastic Carrier Bags are Harmless To The Environment
High Marks From The Federal Office of the Environment

Now it's official, although it's been an open secret for more than a year : Carrier bags made of polyethylene are harmless to the environment. That is the result of an investigation which has now been published by the Federal Office of the Environment (UEA). The Office had compared the effects on the environment in a study of carrier bags made from polyethylene and paper and handed out high marks for the plastic carrier bags.

In the study by the UEA, the input of raw materials and energy, the damage to the environment during manufacture and waste management, the possibilities of recycling, as well as the influences on the environment from this, which must be taken into account, were investigated.

For the first time, the study confirms officially that the use of plastics is ecologically justifiable and, in respect of a series of environmental parameters, is actually considerably more advantageous than alternative products.

Damage to the Environment from the Manufacture of 50,000 Carrier Bags

		Polyethylene	Kraft Paper Unbleached	Paper Combination
Total Energy Consumption		67,00 GJ	96,00 GJ	98,00 GJ
SO ₂	)	9,90000 kg	19,40000 kg	28,10000 kg
NO _x	)	6,80000 kg	10,20000 kg	10,80000 kg
CH	) Waste Gas	3,80000 kg	1,20000 kg	1,50000 kg
CO	)	1,00000 kg	3,00000 kg	6,40000 kg
Dust	)	0,50000 kg	3,20000 kg	3,80000 kg
CSB	)	0,50000 kg	16,40000 kg	107,80000 kg
BSB5	)	0,02000 kg	9,20000 kg	43,10000 kg
CH	) Effluent	0,00300 kg	Not applicable	Not applicable
Phenols)		0,00010 kg	Not applicable	Not applicable
AOX	)	Not applicable	Not applicable	5,00000 kg

For example, in the report by the UEA it says, among other things, about waste management:

Paper carrier bags contribute considerably to emissions on disposal sites. The extent is not quantifiable. Microbiologically, the decomposition of polyethylene is very difficult. In this respect, polyethylene carrier bags do not make any contribution worth mentioning towards emissions entering water seeping into the ground or gases on disposal sites.

With regard to their proportion of the heavy metal input in incineration plants for domestic rubbish, which is determined primarily by colour pigmentation, polyethylene and paper carrier bags are to be classified as equal.

In the case of composting waste, it is possible to make a definite statement: Paper is suitable as an initial material for composting, whereas polyethylene is not a suitable raw material for this process of waste management and causes disruption.

The interference to the landscape caused by litter is not quantifiable, but should be mentioned.

COMPARISON OF THE EFFECTS ON
THE ENVIRONMENT FROM
POLYETHYLENE AND PAPER
CARRIER BAGS

Worked out by The Federal Office of the Environment

Federal Office of the Environment

Publisher: Federal Office of the Environment
Bismarckplatz 1
1000 BERLIN 33

Tel: 030/8903-1
Telex: 183 756

Editing: Specialised Area II 2.4
Dr Wolfgang Pillehn

Berlin, August 1988

Fee: DM. 10,-

PREFACE

The comparative assessment of damage to the environment from differing substances with specific effects in individual environmental media is always problematic. It requires weighing up social, ethical and aesthetic values, for which no generally valid and recognised standards of comparison exist. In principle, for a scientifically comprehensible comparison, only criteria can be used which can be recorded rationally. Other aspects of the complex system, the environment, such as for example, questions of aesthetics, of social acceptance, or of pedagogic symbolic content, cannot be taken into consideration very often, owing to a lack of objectiveness.

Nonetheless, in special cases, damages to the environment caused by man can be made comparable to the extent that the correct decision, from the ecological point of view, is obvious. In the area of production, there are examples of this, such as asbestos or fluorochloro hydrocarbons for which the negative ecological effects of a substance become so clearly evident that measures including bans, or at least restrictions on application, are justified.

On the other hand, in most technological processes and products, it is not obvious which of the variants in the sum total leads to more-or-less ecological damage. Particularly, where the quantity of production is high, such assessments are meaningful. Consequently, ecological comparisons are necessary, even if they are full of difficulties.

In the comparison between polyethylene and paper carrier bags, no doubt the impression which existed among the public was that polyethylene had ecological disadvantages compared with paper. This led some communities and institutions to change from polyethylene to paper carrier bags for ecological reasons. We have taken enquiries relating to this, which were put to the Federal Office of the Environment as an opportunity to ascertain the effects on the environment produced by these two products and to compare them with each other. A first draft was worked out in 1986 and has been discussed widely and controversially since then. The new aspects and information presented, particularly by the manufacturers, have some influence on the report at hand. This report is intended to provide a basis for the assessment of effects on the environment in this special area of the nature of packaging. The conclusions of the comparison cannot necessarily be applied to other products made of polyethylene.

As a rule, both the polyethylene carrier bag and the paper carrier bag are used only once. Also, in order to show alternatives to the use of these throw-away products which would do justice to the problem of high quantities of waste, as well as the problem of inadequate possibilities of re-using the substances from plastics in domestic refuse, the environmental effects from the traditional shopping bag have been estimated. This example confirms the result which is actually self-evident: Any relief of the strain on the environment worth mentioning is only achieved when a carrier bag is used which can be used repeatedly, whether it is made of natural fibres such as jute or of synthetic fibres such as polyamide.

Dr. Heinrich von Lersner
President of the Federal Office of the Environment

3.6. Conclusion

The comparison of carrier bags, such as those offered in retail grocery shops for example (12L volume and a load-bearing capacity of about 5 kg), comes to the conclusion:

For ecological reasons, it is not sensible to change from polyethylene to paper carrier bags. Polyethylene carrier bags require less energy for manufacture and cause, in all, less damage to the environment (chapter 3.1 and 3.2 of the appendix). There is no significant difference between the polyethylene and paper carrier bags regarding waste management on disposal sites or in waste incineration plants (chapter 3.3 of the appendix). This is where the (common) problem lies with the quantity of waste. However, even a change from paper to polyethylene carrier bags would not contribute significantly to a reduction of the burden on the environment. With the large number of one-way carrier bags used (annually almost 3 thousand millions in the Federal Republic of Germany), this is only possible by using reusable bags, e.g. made from polyamide or jute and, primarily, by using the traditional shopping bag. The energy consumption and the damage to the environment from the manufacture of that type of bag are many times less.

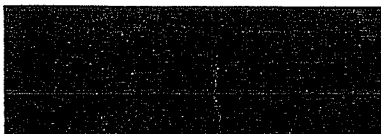
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**OVERVIEW:
SOLID WASTE
DISPOSAL ALTERNATIVES**

An Integrated Approach for American Communities



Keep America Beautiful, Inc. is a national, nonprofit, public education organization dedicated to improving waste handling practices in American communities.



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Keep America Beautiful, Inc. gratefully acknowledges the assistance, expertise and review of those organizations and agencies serving on the KAB Solid Waste Task Force in the development of the
Overview: Solid Waste Disposal Alternatives.

American Association of Retired Persons

American Public Works Association

American Society of Civil Engineers

Association of State and Territorial Solid Waste Management Officials

Council of State Governments

General Federation of Women's Clubs

International City Management Association

National Association of Counties

National League of Cities

Tennessee Valley Authority

U.S. Chamber of Commerce

U.S. Conference of Mayors

U.S. Department of the Interior National Park Service

U.S. Environmental Protection Agency

The valuable resource material provided for this document by the National Solid Wastes Management Association is equally appreciated.

FOREWORD

As landfill space across the country rapidly diminishes, each of us is challenged to assume a responsible role in managing our waste with the least impact on the environment. To assist in meeting this goal, Keep America Beautiful, Inc. publishes this first comprehensive *Overview: Solid Waste Disposal Alternatives*.

Written for the general public, this document lays out considerations for source reduction, recycling, composting, waste-to-energy and sanitary landfilling. There is no one solution to the garbage dilemma – efficient disposal requires an integrated approach, with all or some of the alternatives working in concert.

As the public begins to understand more about solid waste, people begin to see the inter-relationship between the refuse that lies on the street as litter and that which becomes “invisible” when the trash collector takes it away.

Today this “invisible” waste is resurfacing as landfills reach capacity, and siting new waste processing/disposal facilities is blocked by locally formed NIMBY (not in my back yard) groups. Stemming in large part from a lack of objective information on disposal techniques, the NIMBY syndrome results in fear, frustration and inaction. Keep America Beautiful, Inc. believes that educating citizens, civic groups, businesses and elected officials will ease this situation and allow municipalities to go forward with solid waste management planning.

In order to make informed decisions, the first step is to gather the facts. This approach has been used successfully for 13 years by the Keep America Beautiful System – KAB, Inc.’s major program that is sustaining litter reductions and encouraging recycling in 430 cities, towns and counties.

This publication will give you the facts on the varying methods to dispose of municipal solid waste. With this knowledge, you will discover many opportunities to change attitudes, create new levels of awareness in your community and ultimately assist in resolving the nation’s waste disposal problem.

Roger W. Powers
President
Keep America Beautiful, Inc.



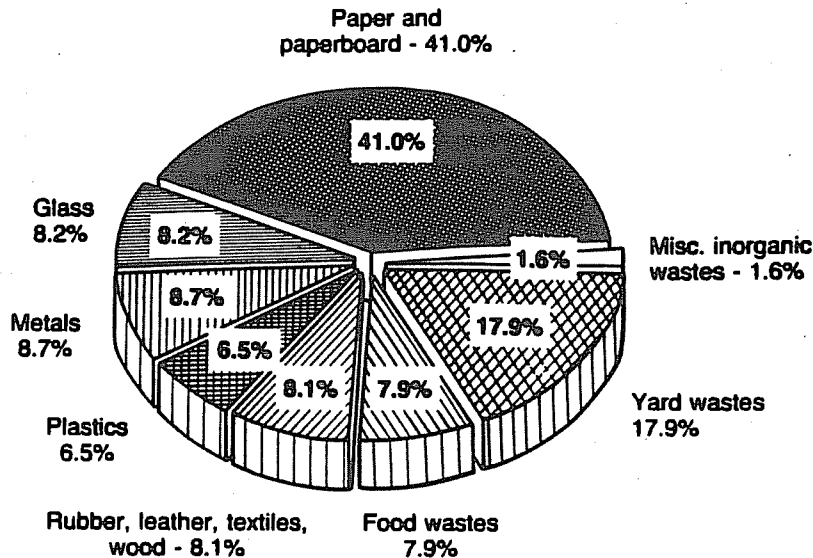
I.

OVERVIEW OF MUNICIPAL SOLID WASTE DISPOSAL

Municipal solid waste (MSW) is constituted from household, commercial, institutional, light industrial (including a slight amount of hazardous waste), and small quantities of special wastes, such as from hospitals and laboratories. This document will focus on waste from household, commercial and institutional sources and does not attempt to deal with the medical waste issue.

In a 1988 study conducted for the U.S. Environmental Protection Agency by Franklin Associates, Ltd., it was estimated that we produce 157.7 million tons of municipal solid waste per year. This figure breaks down to the equivalent of 3.5 pounds of trash produced daily by every man, woman, and child in the U.S. The same study predicts that the total amount of MSW generated annually will grow to 192.7 million tons by the year 2000 as the population increases.

As the quantity of garbage increases, landfill capacity is diminishing. Major cities including New York and Los Angeles will exhaust their landfill space in just a few years – Philadelphia and others are already out of space.



GROSS DISCARDS, BY WEIGHT, OF MSW MATERIALS, 1986
(Source: *Characterization of Municipal Solid Waste in the United States, 1960 to 2000*; Franklin Associates, Ltd., 3/30/88)



Today the U.S. is recycling approximately 11% of its trash, another 13% is incinerated for energy recovery and the remainder is being disposed of in landfills. Yet the U.S. Conference of Mayors predicts that over half of the nation's 9,300 landfills will face closure in ten years.

Historically, managing MSW has been the responsibility of local governments to protect public health and community livability standards. The federal government has attempted to provide guidance through the 1965 Solid Waste Disposal Act, the 1970 Resource Recovery Act and the 1976 Resource Conservation and Recovery Act (RCRA). RCRA amends the preceding bills to provide a program to regulate hazardous waste, to eliminate open dumping, to promote solid waste management programs and to further solid waste management options in rural communities through grants. It is the states' responsibility to carry out these laws.

Many federal regulations and the reauthorization of RCRA, that will play a vital role in future waste management decisions, are currently in a state of transition. These laws will affect standards for landfilling, waste-to-energy ash management and air emissions.

In order to deal with the waste this nation produces we can not look to a single solution. Effective management requires an integrated approach – the consideration of a number of technologies working compatibly – including reducing the amount of waste produced, recycling, composting, waste-to-energy incineration and sanitary landfilling. ■

II.

SOURCE REDUCTION

Reducing the amount of waste that is produced and thus discarded must be a priority for government, industry and individuals alike. The U.S. EPA defines source reduction as minimizing toxic substances in products, reducing the volume of material that must be discarded and manufacturing products with longer, more useful lives. The EPA has called for a 25% reduction in waste through source reduction activities and recycling by 1992.

Reducing toxic substances involves finding substitutes for heavy metal compounds, including the lead and cadmium found in batteries and other products. To prevent toxic substances' presence in disposal by-products such as compost, incinerator ash and landfill leachate, it is necessary to reduce them in the waste stream.

The volume of material that must be discarded can be reduced through product reuse and product redesign to lessen material usage per unit of product. Reusing products is as simple as donating or selling old household appliances rather than discarding them, or repairing torn clothing rather than discarding it.

Reducing material usage per product unit results in less waste generated when the product is discarded. For example, steel can manufacturers in recent years have reduced the weight of cans so that more units per pound of steel are being produced. A study conducted by G. Kellman, P.E., indicates that consumers purchasing packaged products in larger container sizes will reduce the amount of packaging entering the waste stream as long as purchasing the larger size does not result in increased food waste due to spoilage. For example, a single 16-ounce can uses 68 grams of metal, or 40% less than the 95.4 grams used in two 8-ounce cans.

Additionally, The Procter & Gamble Company, a major producer of consumer products, is reducing material usage through the redesign of their products and packaging. For example, consumers can now purchase small packets of concentrated products and dilute them at home using larger existing containers. Other methods include refill packaging – products which are sold in space efficient forms, but are then transferred to permanent, durable containers for storage and use; package efficiency – redesign of bulky display packaging for space and materials efficiency; and single packaging – removal of outer cartons and wraps.

Source reduction can also be accomplished by manufacturing products with longer useful lives. Here again, household appliances can be produced that last longer and are repairable. In the case of automobile tires, product durability has been increased. Since 1973 tire durability has almost doubled – today's radials have an average life of 40,000 miles as compared to 15-20,000 miles for bias and bias-belted tires. ■



III.

RECYCLING

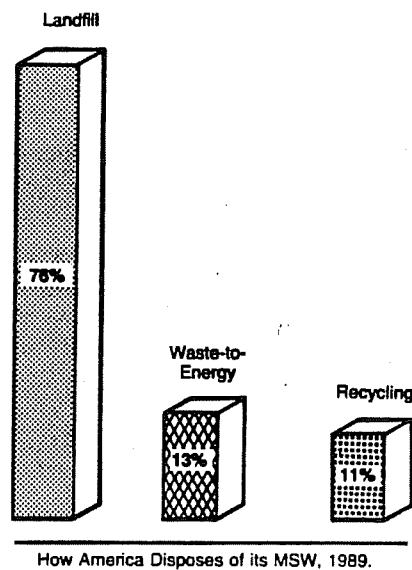
In an integrated plan to dispose of MSW, recycling plays a major role. Communities should attempt to recycle as much waste as possible, but they must also realize that recycling alone can not solve the solid waste disposal problem.

There are varying reports on the *potential* recyclability of MSW, ranging from 25-80%. Most agree, however, that recycling can realistically reduce the amount of MSW by approximately 25% over time, although this may differ considerably from municipality to municipality. Today the U.S. is recycling approximately 11% of its MSW.

In addition to reducing the waste stream, recycling conserves natural resources and energy. Recycling also has the ability to generate revenue. However, it may cost money depending on the strength of the markets. Generally, it is best to look at recycling in terms of cost avoidance. Although recycling may cost money, the removal of recyclable materials from the solid waste stream can reduce the expense of incineration and/or landfilling, thereby making recycling cost-effective if it doesn't exceed the traditional cost of disposal.

Recycling is a technology which involves collection, separation, preparing to buyer's specifications (e.g., baling), sale to markets, processing and eventual reuse of materials.

It is important to understand that the separation and collection of recyclable material is only the first step in the process. If material is not processed and returned to commerce, then it is not being recycled. In many parts of the country, markets for recycled materials are not yet sufficiently developed to handle the growing supply of collected material. When developing a collection program, it is imperative that attention be paid to developing markets.



Markets

Intermediate markets include scrap dealers or brokers. They allow the materials to accumulate, process them to market specifications and then ship them to final markets. When markets are low, scrap dealers will inventory the recycled product until the price goes up.

Final markets are facilities where recycled materials are converted into new materials. They are the last phase in the recycling circle.

MATERIALS RECYCLED TODAY

Aluminum

Aluminum, particularly cans, is a very valuable commodity. In 1972, 1.2 billion cans were recycled. In 1987, a total of 36.6 billion cans were recycled – 50.5% of all cans.

Recycling aluminum saves a tremendous amount of energy. It takes 95% less energy to produce an aluminum can from an existing one than from ore. In 1987, for example, the Aluminum Association says aluminum can recycling saved 10 billion kilowatt-hours of electricity – enough to supply the residential electric needs of New York City for over six months.

Various forms of aluminum are recyclable, with cans being the most common. Siding, gutters, downspouts, storm door and window frames, lawn furniture frames, etc. are also recyclable. A magnet, which will attract iron and steel but not aluminum, should be used to make sure aluminum is not contaminated by other metals. To command the highest price, cans must be kept separate.

Aluminum can be separated from MSW through source separation (separating recyclables from the waste stream at the point of generation, e.g. at home) or by technology such as separating and sizing devices like trommel screens, air classifiers and magnetic separators.

Paper

Over 30% of all the paper and paperboard used in this country is now being collected and utilized as either raw material to make recycled paper and paperboard or as an export to countries overseas.

The paper market fluctuates with the world economy, which primarily drives the demand for recycled paper. The U.S. housing industry, which is sensitive to economic trends, uses a significant portion of the recycled paper in roofing shingles, tar paper and insulation. Another major portion of recycled paper, particularly newsprint, is sold to foreign markets, whose fluctuations are subject to worldwide economic trends. Newsprint is most frequently recycled into new newsprint or recycled paperboard.

Collection has increased from 12.5 million tons in 1970 to 26 million tons in 1988. Currently, 200 paper mills in the U.S. process waste paper, and there are approximately 2,000 waste paper dealers in the U.S. which buy paper from collectors. Paper mills will also buy recyclable paper at their facilities.



Four broad grades of waste paper are recycled: old newspapers, old corrugated containers, mixed office waste, and high grade waste paper.

Old newspapers represent the major grade of post-consumer waste paper that is source separated for recycling. In 1986, 30% of consumed newsprint was recovered for recycling.

Old corrugated containers (OCC) are generated in bulk from retail stores and factories. Large supermarkets usually bale their OCC and sell it directly to recycling mills. Small retail stores and factories may depend upon individuals who collect the material in their own vehicles. Usually these individuals do not pay the generator for the waste, but save them the cost of contracting with a private hauler to remove the used containers. Forty-two percent of old corrugated containers were recovered in 1986.

Generally separated in large office buildings at employees' desks, mixed office waste represents a relatively new grade of waste paper. Separate racks are placed on desk tops for white paper collection that are then emptied into a central collection bin and periodically removed and taken to the loading dock for a hauler to pick up.

Waste paper dealers may also buy mixed office waste and hand sort it into many grades – depending on their customers' specifications.

Finally, high grade waste paper is generated in paper converting plants. The envelope, business form, book and catalogue machine trimmings and clippings are usually of such high quality and value that the commercial printer who generates this high grade waste sells it directly to a recycling mill or to a waste paper broker.

Contaminants of Waste Paper

Waste paper that is recycled must be free from other wastes, particularly food wastes, which contaminate the paper with bacteria and cause odor.

Other materials which must be removed to make the paper a higher quality are: metal, glass, rubber, plastics, textiles, wood and other extraneous materials. These contaminants are not easily removed in the recycling process and must therefore be hand sorted from the paper.

While recycling is greatly encouraged and a necessary means to reduce the waste stream, it is not "clean disposal." There are significant effluents from recycling processes, particularly the paper de-inking process which may contain lead, thus requiring very careful management and disposal.

Oversupply

Dealers may discourage collection during a period of oversupply. When the world economy is in a period of recession, the consumption of waste paper declines and additional collection is unwarranted. The growing popularity of mandatory recycling in the U.S. (which actually mandates collection, not recycling) may also result in the oversupply of waste paper and weaken markets.



Glass

The primary components of glass – sand, soda ash and limestone – are in abundant domestic supply. However, the use of cullet (crushed glass) in the manufacturing process has economic advantages over virgin materials. Cullet melts at a lower temperature than the raw materials, allowing manufacturers to reduce energy usage and particulate emissions into the atmosphere.

Over the past several years, the market for cullet has been characterized by high demand and increasing prices. The most common use of collected glass containers is as a direct substitute for raw materials used in the production of new glass containers. Recycled glass is also used in the manufacture of fiberglass.

Approximately 1,250,000 tons of glass (5 billion containers) are recycled annually in the U.S. Used glass bottles and jars are collected and remelted with raw materials to make new glass containers. In the last ten years there has been a 453% increase in post-consumer glass collection. Eighty-six glass container manufacturing plants produce new containers in part from recycled glass. And, according to the Glass Packaging Institute, 25% of any given glass container is made from recycled glass.

Contamination

Processing equipment is designed to remove contaminants such as magnetic metals, aluminum caps and labels. Some of the contaminants (like food residue), remain with the cullet and are burned in the melting process. Ceramic materials are not easily removed during processing. Therefore, caution must be taken in collection to avoid contamination with ceramic materials such as baking glass and headlight lenses.

To ensure quality cullet, consumers generally separate glass from other household wastes. Glass is also frequently separated at intermediate processing facilities.

Plastics

Plastics recycling is a growing field. Plastics make up approximately 7% of the municipal solid waste stream (4% being plastic packaging) and are expected to comprise about 10% by the year 2000. Currently three types of plastic are being successfully recycled while research is being pursued for other varieties.

PET

The most common plastic container being recycled is the PET (polyethylene terephthalate) soft drink container, and approximately 20% are being recycled today. Because of contamination concerns, recycled PET is not used for food packaging; it is, however, commonly being used to manufacture carpet backing and fiberfill for items such as sleeping bags and ski jackets.

Some reclaimed PET bottles are being converted to polyol, a chemical ingredient used in manufacturing rigid urethane foam to produce such products as refrigerator insulation, automobile bumpers and furniture.

Unsaturated polyester made from recycled PET bottles is used in making fiberglass bathtubs, shower stalls, corrugated awnings and swimming pools.

Manufacturers are also using recycled PET to produce engineering plastics such as appliance handles, power tool housings and automotive parts as well as floor tiles, paint, paint brushes and kitchen scouring pads. The Procter & Gamble Company is marketing nonfood products in recycled PET containers.

HDPE

Another type of plastic container that is being recycled is HDPE (high density polyethylene) commonly used for milk jugs and the base cups of PET soft drink bottles. These plastic bottles are easily identifiable and recyclable because they are all made from the same plastic material. Recycled HDPE, like PET, can not be used for food packaging. However, a variety of secondary uses are being created such as new base cups for PET soft drink containers, trash cans, flowerpots, piping and traffic cones.

Additionally, recycled HDPE is being used commercially on a small scale to make "plastic lumber." The lumber is being used for railroad ties, decking for boat piers and docks, and fencing. It has benefits over wood in that it does not rot, splinter or chip. The lumber also does not have to be painted, because the desired color can be pigmented into the material.

Polystyrene Foam

Polystyrene foam items such as cups, plates and fast-food carryout containers are beginning to be recycled across the country. Several programs are in place or in the developmental stages.

The material is collected in special trash receptacles at schools, fast-food restaurants, and other institutions, and is then cleaned and converted into pellets. The pellets can be recycled along with other plastic materials to create plastic lumber for walkways, benches, etc., or they can be used to make building insulation and packing material.

According to Dr. William Rathje, an anthropologist at the University of Arizona who has excavated several major landfills, polystyrene foam foodservice products used in this country represent approximately one quarter of one percent (0.25%) of municipal solid waste.

Commingled

Plastics recycling is more complicated than other materials recycling because of the variety of resins used in the manufacture of different plastics – resulting in the difficulty in sorting the plastic by resin. For example, two brands of mouthwash may be packaged in bottles composed of different plastics yet appear similar to the eye.

In response, the plastics industry has developed a voluntary coding system to identify what plastic material the bottles are made of and to encourage increased separation and recycling of more plastics. Several manufacturers are now coding their plastic packaging.

For those plastics that can not be sorted, because the recycler does not have the accommodations for such a system, or because it is not economical, commingled plastics recycling is now a feasible alternative.



Commingled collection of plastic and subsequent recycling is being investigated by the Plastic Recycling Institute at Rutgers University. Unseparated and uncleaned plastics are mixed together and processed to a very dense material that can be used as fence posts, car stops for parking lots, and as park benches.

Other Plastics Recycling

Other examples of plastics recycling involve plastic bags and garment bags of low density polyethylene, and the recycling of polypropylene automotive battery cases.

In each case, the success of these recycling efforts is related to a continuous supply of material and an application for the recovered material which provides satisfactory performance and economic incentives.

Iron and Steel

Steel is recyclable, in whatever form it reaches the public – pipes, automobiles or food cans. It can be remelted and shaped into new steel products. In fact, iron and steel are the most recycled materials used today. In 1987, according to The Steel Can Recycling Institute, 51 million tons were recycled, more than twice the amount of all other materials combined.

The use of post-consumer ferrous (containing iron) products as a scrap metal is not new. Metal from consumer waste products such as discarded automobiles and large appliances have traditionally been remelted. Until recently, however, only very small percentages of steel ("tin" cans and bi-metal cans) were used for remelt.

Steel scrap must be segregated into categories so that mills can melt it into quality products. Unwanted contaminants such as paper and wood can be burned off, but other metals can contaminate the end product.

The amount of purchased scrap consumed by the steel industry has increased in recent years, and technological developments in the steel industry promise an even larger market for industrial scrap (generated in manufacturers' plants) and obsolete scrap (material from the waste stream, old rails, food and beverage containers) as steel mills become more efficient and generate less of their own scrap.

A record number of U.S. steel mills, 20 in all, now purchase and melt can scrap to make new steel. They provide markets for the increasing amount of steel collected in municipal recycling collection programs and for the scrap generated in resource recovery plants which magnetically separate scrap and other ferrous materials from municipal solid waste.

Approximately 3 percent of U.S. annual steel production is in the form of containers for food and beverages. The industry itself has embarked on an aggressive campaign to attract more steel can scrap into the recycling stream and to help state and local governments eliminate ferrous scrap from the municipal waste stream.

Scrap metal dealers and brokers also represent a large potential market for all types of recovered metals. They can provide a regular market, process the material as required and resell to the ultimate buyer. Additionally they can provide a service in transporting the recovered ferrous metals to the final market.



Other Forms of Ferrous Recycling

Other markets for ferrous metals recycling include tin, iron foundries, the production of ferro-alloys and the copper precipitation iron market. More information on these forms of recycling is contained in Keep America Beautiful, Inc.'s *Multi-Material Recycling Manual*.

Scrap Tires

Well over a billion discarded tires are stockpiled around the country. Tires are usually discarded at retail outlets that sell and mount new tires. They are sorted, and those found satisfactory are retreaded. The remainder, in some cases, are shipped to recyclers, frequently the seller of new tires. Where there are no markets, or acceptable disposal sites, the tires pile up.

Landfilling of whole tires is banned in many states because they cannot be compacted and often rise to the surface due to the resiliency of the rubber. Some landfills require that tires be shredded or split, while others discourage tire disposal by charging disposal fees of \$1 or more per tire. Abandoned tires serve as a breeding ground for mosquitos and, when ignited, can take months to extinguish and produce oil-like liquids which can contaminate surrounding surface water and ground water.

The difficulty of disposal is directly related to the lack of markets for the scrap tires. Increased recycling promises a diminishing stockpile of discarded scrap tires, a savings of landfill space, and the assurance that a valuable material and potential energy source will not be wasted.

Following is a brief synopsis of how tires are being reused in the United States:

- **Reclaimed Rubber**

Approximately 10 million tires are disposed of annually through a reclamation process involving grinding, shredding and pulverizing the tires. The material is formed into sheet rubber and sold in bales to producers of molded materials and semi-pneumatic tires.

- **Retreading**

Retreading requires about 30% of the energy necessary to produce new tires and it provides nearly 80% of the mileage of a new tire. Almost 20 million truck tires and 17 million passenger tires are retreaded annually. The market for good quality used tires will always exist in the retreading industry.

- **Marine Use**

Scrap tires are being used as artificial reefs, created by stringing tires together with non-corrosive cable and drilling holes in them so they will sink in the water.

- **Incineration**

Tires added to mass burn units or shredded tires in a refuse-derived fuel system burn completely and are a good source of fuel. Additionally there are waste-to-energy plants that solely burn chipped tires, known as tire-derived fuel. Other plants burn whole tires to produce electricity.



● Crumb Rubber

Crumb rubber or ground and shredded rubber can be added to other materials in the manufacture of new products. Following are methods of waste tire recycling utilizing some form of crumb rubber:

- Asphalt-Rubber: is ground rubber mixed in a bituminous concrete used as an interlayer that reduces stress and prevents cracks. The production of asphalt-rubber is presently more costly than standard bituminous pavements, but it lasts longer and is cost-effective.
- Tirecycle: a trademarked process which produces a rubber compound primarily from ground scrap tires. The compounds can be used in the manufacture of virtually any rubber or plastic product.

Used Oil

Used oil is a valuable, renewable resource that must be handled wisely to prevent careless disposal down sewers or in landfill sites which may contaminate surface and ground water. This handling should include reuse practices such as re-refining into lubricating oil and carefully controlled burning for energy recovery.

Fifty-seven percent is reprocessed with water and particulates removed. It is then used for fuel. Twenty-six percent is re-refined and turned into base stock. With additives, it is used as lubricating oil and put to other uses. Seventeen percent is used for road oil, dust control, wood preservative or "fire log" ingredients.

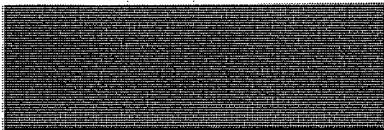
According to the U.S. Department of Energy, used oil is generated at a rate of approximately 1.2 billion gallons annually. This is equivalent to approximately 78,000 barrels a day. Approximately 60%, or 700 million gallons, is used motor oils. The remaining 500 million gallons are industrial used oils such as hydraulic, metal working and cooling oils. Of the total oil generated, two-thirds is recycled, primarily as a fuel. The remaining 400 million gallons, however, are disposed of or dumped.

COLLECTION TECHNIQUES

A variety of methods are used to collect materials for recycling including single and multi-material curbside collection, drop-off and buy-back centers. In every case, a key to success is convenience for the disposer and for the handler.

Curbside Collection

This method requires consumers to sort waste into separate containers that hold the same type of recyclable material. Source separated materials can include newspapers, glass, aluminum and bi-metal containers, corrugated cartons, selected plastic containers such as PET and HDPE,



and used oil. In some cases, all recyclables are placed in one container for separation at an intermediate processing facility.

Many municipalities provide residents with colorful collection bins or clear and colored plastic bags to separate materials accordingly. They are set out on specified collection days, collected by crews and transported to a processing center, storage facility or straight to market. Studies have shown that separating trash is easy, taking approximately fifteen minutes per week.

Curbside collection generally enjoys a high participation rate. Two very successful voluntary programs are in Mecklenburg County, North Carolina, with an average participation rate of 31%, and in Champaign, Illinois, with a rate of 65%.

A good way to evaluate a program's effectiveness is to measure the amount of recyclables collected – the percentage of the waste stream that is diverted from landfills – as well as by the number of households participating.

Expense

While curbside enjoys a high participation rate, it is an expensive way to collect materials. This method involves major capital expenditures including collection vehicles and operating costs such as labor, maintenance, administrative and transportation expenses – all of which can become prohibitive. Labor alone can account for 35-85% of operating costs, depending on the amount of processing needed.

Controlling Costs

There are several ways of cutting costs. The purchase of used equipment can be cost-effective because it is seldom used for more than several hours a day. In-kind services can also reduce the burden of starting a curbside program. For example, empty building space can be donated and vehicle maintenance can be performed by existing staff.

The high participation rate also allows for curbside material sales to typically represent 45% of the average program's revenue. Other sources of income include payments for contracted services, grants, surcharges and tax revenues, and disposal credits.

More information on curbside collection expenses is contained in *Comprehensive Curbside Recycling, Collection Costs and How to Control Them*, published by the Glass Packaging Institute.

Methods of Curbside Collection

The most effective approach tends to be once-a-week collection on the same day as garbage pick-up. Again, convenience to the consumer is key. Recyclable materials collected on the regular trash collection day minimizes labor costs by utilizing the same crew. A vehicle with built-in compartments or bins or one that pulls a trailer is generally employed.

Materials can also be collected on a day other than refuse collection day. An advantage is the purchase of additional hauling trucks may not be needed as existing garbage hauling trucks can be used on their off days if collected materials are commingled or if bundled newsprint is collected. If days are not regularly scheduled, however, residents may forget or choose not to store materials for a long period of time.



Multi-Material Collection Centers

A multi-material collection center is a stationary site where residents bring their recyclable materials. In some cases, recyclers are paid for the materials they bring in, in other cases they are simply dropped off and the funds are used to further the program and offset the cost of disposal.

According to the U.S. EPA, drop-off centers are the most common form of collection for households. However, the volume of materials collected and the participation rate is considerably lower than curbside, because it requires residents to prepare, store and transport material.

Advantages of this collection method include the ability to collect a wider variety of recyclable materials—they are not limited to two or three as are many curbside programs. There is also limited expense to this form of collection because less equipment and labor are required to obtain the materials.

Location

Recycling centers located at landfills, incinerators, transfer stations or convenience centers—especially in municipalities without regular refuse collection—experience the best participation rates. They should be convenient to populated areas and be on well-traveled roads. Most consumers who bring materials to a drop-off center live within a five mile radius of the site.

Recycling theme centers have proven to be extremely successful in increasing citizen participation. Centers have been designed to replicate a visit to the zoo, circus, riverboat or old town railroad station. These facilities are designed to make recycling fun for the entire family.

Additionally, successful centers must be able to accommodate small vans and pickup trucks for the volume recycler who collects from other people, bars, restaurants, hotels and hospitals.

The role of advertising and publicity can not be overemphasized. All must be aware of the hours of operation, materials accepted and the prices paid (if it is a buy-back center). A single media campaign will not be effective; the publicity must be year-round, employing a variety of methods to educate citizens. Consider conducting a survey to define operating hours that are the most convenient to the public.

Single Material Buy-back or Collection Centers

Single material recycling centers are also widely used to collect recyclable material. These centers typically collect one of the following: aluminum, glass or newsprint. Reverse vending machines are gaining popularity as a method to recover cans. Reynolds Aluminum Recycling Company is the leading operator of these machines in the U.S. Recyclers simply insert their old aluminum cans into the collection machines and receive cash on the spot. Similarly, there are machines in place that accept steel cans. ■



IV.

COMPOSTING*

Composting can reduce the amount of waste disposed of in waste-to-energy plants or in sanitary landfills. For years, many people have had a back yard compost pile for food and yard wastes. Municipalities are now looking to composting on a larger scale to transform MSW components such as paper, cardboard, food wastes, yard wastes and other miscellaneous organic materials into humus or mulch. Increasingly, communities are organizing programs to compost yard waste – which accounts for over 17% of MSW. Others are diverting a greater portion of the waste stream for composting.

Many communities ignore solid waste composting when evaluating waste disposal options because of a lack of awareness or apprehension about marketing the resulting compost product. Composting is not an option for a major portion of the waste stream. It is, however, a component of an integrated resource recovery program.

Municipalities must realize that composting solid waste costs money. Although revenues generated through the sale of compost products will help defray the facilities' operating costs, composting of solid waste is not going to make money. Rather, the primary benefit of a composting program is the potential for diverting solid waste from landfills and producing a usable compost product economically.

Composting is the aerobic (in the presence of oxygen) biological decomposition of organic waste materials. The process releases carbon dioxide, water vapor and heat. MSW components are decomposed by micro-organisms under controlled conditions during composting. Materials such as metals, plastics, bulky wastes and glass are not compostable.

Solid waste composting results in a stabilized organic material which physically resembles soil or humus material. Compost is a useful additive for improving the physical properties of soil, but it is not a fertilizer. It enhances soil aggregation, decreases soil crusting, and improves water retention, water infiltration, water permeability, soil porosity and soil aeration. Odor results when an anaerobic condition exists, but proper maintenance can control this condition.

Product Quality

EPA requirements must be met in the composting process. Temperatures of greater than 55 degrees Celsius (131 degrees Fahrenheit) must be maintained in the composting material for several days, effectively eliminating viral, bacterial and parasitic pathogens. Monitoring and periodic analysis of the compost assure that all regulatory requirements for the production and use of the compost product are met. MSW composting must be overseen by an experienced operator and the heavy metal content must also be carefully monitored.

* Adapted from a paper presented at the Fourth Annual Conference on Solid Waste Management and Materials Policy in New York City, and written by Eliot Epstein, Ph.D, president, and Todd Williams, environmental engineer, both of E&A Environmental Consultants Inc.



Composting MSW in a centralized plant is different from doing so in a back yard. Back yard composting can be dangerous because of the inability to control the temperature, hence the risk of a contaminated end product.

Recovering certain materials will have a significant effect on the content of metals and other compounds in the resulting compost; nevertheless, the remaining metal content renders mixed waste compost unusable on land that grows food crops. The heavy metal content in compost can be minimized by removing such items as lead acid batteries (used in automobiles).

End Use

Purchasers of compost can be divided into five categories:

- **Growers** tend to demand a higher grade product and include golf courses, landscape contractors, nurseries, etc.;
- **Processors** will refine the compost product to their chemical and physical specifications – this group includes fertilizer contractors, manufacturers/suppliers and topsoil businesses;
- **Re-wholesalers/retailers** generally prefer a bagged product for resale – they include garden centers and greenhouse equipment/supply businesses;
- **Bulk users** represent businesses or operations that use compost on large acreages or in large volume, including land reclamation firms, landfill cover companies, park departments and transportation departments; and
- **Service providers** are those in a position to specify the use of compost on building and landscaping construction and maintenance projects including landscape planning companies and landscape design firms.

Aggressive promotion of any compost product will be required to establish markets and optimize revenues. Development of educational materials such as brochures and recommended guidelines for application are all very good tools to be used in promoting a compost product. Transportation and quality control are also vital to strong sales; the product must be of consistent quality and delivered regularly to develop loyal consumers. These activities must be taken seriously to sell the quantity of compost that is produced.

As with recycling, composting will only be an effective waste management tool if there is a demand for the end product. ■



V.

WASTE-TO-ENERGY

Waste-to-energy (WTE) is taking on a vital role in integrated solid waste management planning. Trash is brought to a waste-to-energy plant where it is either burned as received, or following processing to a more uniform fuel, is burned to generate steam or electricity. Waste-to-energy plants can decrease the volume by 60-90% while recovering energy from discarded products.

According to the U.S. Environmental Protection Agency's Municipal Solid Waste Task Force, there are 135 operational waste combustion facilities – 120 of which recover energy – processing approximately 13% of the nation's municipal solid waste.

Another 93 facilities are under construction. The task force predicts that by 1992 some 27% of MSW will be processed in waste-to-energy facilities.

There are three basic types of plants operating the United States to convert waste into energy. They are:

Mass Burn. About three-fourths of the waste-to-energy facilities in the U.S. are mass burn, where refuse is burned just as it is delivered to the plant, without processing or separation. The fire heats boilers, making industrial steam or electricity. These U.S. plants are sized to incinerate up to 3,000 tons of refuse per day and use two or more burners in a single plant. While facilities are sized according to the expected volume of waste, they are actually limited by the amount of heat produced when the garbage is burned. For example, if garbage burns hotter than it is expected to, less volume of material can be incinerated. Some mass burn plants remove metals from the ash for recycling. Mass burn plants have operated successfully in Europe for more than 100 years.

Modular Combustion Units. Modular incinerators are, for the most part, simply small mass burn plants with capacity ranging from 25 to 300 tons per day. The boilers are built in a factory and shipped to the plant site, rather than being erected on the site as is the case with larger plants. These facilities are often used in small communities.

Refuse-Derived Fuel (RDF). In an RDF plant, waste is processed before burning. A typical plant will remove noncombustible items, separating glass and metals for recycling, and shred the combustible waste into a smaller, more uniform particle size for burning. RDF requires significantly more sorting and handling than mass burn but does provide greater opportunity to separate recoverable materials and to remove environmentally harmful materials prior to combustion. The RDF thus produced may be burned in boilers on-site, or it may be shipped to off-site boilers for energy conversion. If it is to be shipped off-site, it may be densified into fuel pellets. Several years ago, RDF was used mainly along with coal in coal-fired burners. Now, however, it usually is burned in dedicated boilers designed and built especially for the RDF.



Cogeneration facilities also have the capability of burning solid waste. Cogeneration produces both electricity and thermal energy in the form of steam or hot water. Most cogeneration facilities use natural gas or coal; others use various form of biomass (wood, cornhusks, MSW). Some waste-to-energy plants are cogenerators, such as the 2,250 ton-per-day plant in Baltimore.

Compatible with Recycling

In an integrated resource recovery system, waste-to-energy is totally compatible with recycling, composting and other components. Savings from reducing the amount of waste to be burned can be significant; reducing the size of the plant can also reduce siting problems, as well as lower the initial cost of the waste-to-energy facility. Recycling may improve the efficiency of waste-to-energy plants by removing noncombustibles such as glass and metal, allowing the garbage to burn at a higher heat level and reducing the amount of ash produced. Removing metals may also reduce many of the pollutants, such as lead and cadmium, associated with incinerator emissions and ash.

If a community plans to develop an integrated resource recovery program, then the amount of recycling expected should be figured into the preliminary plans for building the incinerator. Reducing the volume of garbage after the plant is built lowers its utilization, thereby raising costs. While the volume displaced by recycling may be recovered by importing waste from the surrounding area, this may result in strong citizen opposition. Proper planning can avoid such a situation.

Landfills Still Needed

Landfills will always be necessary to dispose of ash and non-burnable material. We will never eliminate the need for landfills, only lessen the amount of material that need be disposed in them.

Cost

The price of building a waste-to-energy facility is high – as much as \$400 million for an extremely large plant. However, the facility promises to keep trash disposal costs reasonably stable for 25 or more years – the life of the plant. The revenue from the sale of electricity and/or steam plays a major role in offsetting the cost of the facility.

Generally, tipping fees account for 25% to 40% of plant revenues. Without a strong market for the produced energy, the plant may not be economically feasible.

PURPA

A 1979 federal law, the Public Utility Regulatory Policy Act (PURPA), helps to ensure that small power generators – including waste-to-energy facilities – will have a market for produced energy. PURPA requires utilities to purchase such energy from qualifying facilities at avoided costs, that is, the cost avoided by not generating the energy themselves. However, in some areas the avoided cost is so low that the utility is not a viable market for the energy.

It may be more advantageous for a waste-to-energy developer to seek a market for the steam produced. Some facilities, for example, supply steam to industrial plants or to district heating systems.

AIR EMISSIONS

Incinerators burning MSW can produce a number of pollutants, generally in very small quantities, including carbon monoxide, sulfur dioxide, and fine particles containing heavy metal compounds (e.g., from lead and dioxins). The generation of pollutants and their release into the atmosphere is now being effectively reduced or prevented by a number of air pollution control devices built into modern waste-to-energy facilities.

Many of these pollutants are formed as a result of incomplete combustion. That is, refuse that is not burned at high enough temperatures, for long enough or when too much or too little air has been added to the fire. The generation of pollutants can thus be controlled by proper operation of the WTE facility.

Following is a summary of the air emission control devices now being used to remove pollutants from incinerator stack emissions.

- **Dry Scrubbers** "wash" particulate matter and gases from the air by passing them through a liquid. The scrubber removes acid gases by injecting a lime slurry (a watery mixture) into a reaction tower through which the gases flow. A dry powder containing salts is produced and collected along with the fly ash in an electrostatic precipitator (see below) or in filters and discharged along with the fly ash into the ash residue. The lime also causes small particles to stick together, forming larger particles that are easier to remove. Ash is stabilized by the addition of lime which enhances its natural alkalinity.
- **Electrostatic Precipitators (ESP)** use high voltage to negatively charge incoming dust particles, then the charged particulates are collected on positively charged plates. ESPs – documented as removing 98% of particulates, including heavy metals – are very commonly used as WTE air pollution control devices. Nearly 43% of all existing facilities use this method to control air pollution.
- **Fabric Filters (Baghouses)** consist of hundreds of long fabric bags made of heat-resistant material suspended in an enclosed housing which filters particles from the gas stream. Fabric filters are able to trap fine, inhalable particles. According to the National League of Cities, fabric filters capture 99% of the particulates in the gas flow coming out of the scrubber, including condensed toxic organic and heavy metal compounds.
- **Stack Height** is an extra precaution taken to assure that any remaining pollutants will not reach the ground in a concentrated area. When the gasses enter the stack they are quite clean due to the controls discussed above. Stacks being built today are 200-300 feet or more in height, twice as high as the stacks used on older municipal incinerators.

Using the best available control technologies, the National Solid Wastes Management Association states more than 95% of the remaining gases and fly ash are captured and removed. These technologies include scrubbers, electrostatic precipitators and fabric filters.

EPA is developing air emission standards for municipal incinerators. Because currently there are no national standards, states are increasingly formulating their own.



In recent years, one group of chemical compounds, dioxins, has attracted special attention. These compounds are found in many foods – including fish, poultry and eggs – and occur in such common products as wood pulp and paper. About 75 different forms of dioxin have been identified.

Fortunately, such compounds can be destroyed. By maintaining very high temperatures during the combustion process, waste-to-energy plants eliminate virtually all of the dioxins that are produced. If small amounts survive, they are entrapped within pollution control devices. In fact, studies have shown that a combination of scrubbers and fabric filtration systems can remove up to 99 percent of these large molecules.

ASH MANAGEMENT

Ash is the solid material that is produced from the combustion of all fuels. It is composed of the following two general types of components: 1) noncombustible inorganic materials that are present in the fuel such as cans, bottles, rocks and stones; and 2) complex organic materials that are formed primarily from carbon atoms that escape combustion and are present in small quantities as part of the small soot residue.

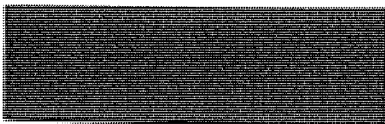
Municipal solid waste contains many noncombustible materials that are found in its ash. Of primary concern is the presence of the metals lead and cadmium. Sources of these materials have been identified in a recent U.S. EPA report. Lead acid batteries used in autos contribute up to 65% of the lead in MSW. Other sources include consumer electronics such as televisions and radios, glass and ceramics, and plastics. Fifty-two percent of the cadmium in MSW comes from rechargeable household batteries, the rest coming from plastics, consumer electronics, old appliances, pigments, glass and ceramics.

Two types of ash are produced:

- **Bottom Ash** – large and moderate-sized unburned and unburnable matter left after the waste has passed through the combustion chamber. This ash comprises 75 to 90 percent of all ash produced, depending on the technology employed.
- **Fly Ash** – a powdery material suspended in the flue gas stream, collected in the air pollution control equipment. Fly ash tends to have higher concentrations of certain metals and certain organic materials and comprises approximately 10-25% of total ash generated.

Bottom ash and fly ash are usually combined, because it is more easily stored, handled and transported than the fly ash by itself. Importantly, combining the two ashes dilutes the concentration of harmful substances and reduces leaching.

The greatest concern with ash is proper disposal and the potential for harmful substances in the ash to be released into the ground water. Research to date has shown that ash disposed



of in a properly designed, constructed and operated landfill does not pose a threat to ground water, because

- quantity and concentration of substances that leach out of ash is low, thereby resulting in less-than-toxic concentrations in receiving water bodies; and
- a properly designed and operated landfill prevents the migration of leachate (from ash or garbage) into ground water.

A report on waste-to-energy ash by Roy F. Weston, Inc. offers the following thoughts:

The fact that substances, which at high enough concentrations can exhibit toxic properties, are present in ash does not in and of itself mean that ash is a danger to health or the environment; it is the potential for these substances to come in contact with the environment or the public, at concentrations high enough to impact health, that must be evaluated in order to understand the impacts associated with this material.

Federal Regulations

Federal regulations governing WTE ash are currently in a state of transition. The issue in question is whether ash should be regulated as a hazardous or nonhazardous waste as specified in the Resource Conservation and Recovery Act of 1976.

EPA Draft Guidelines

EPA has offered draft guidelines for handling ash until new regulations are adopted regarding the handling, transport, storage and disposal of ash.

Their provisions include:

- ash containers and transport vehicles must be leak-tight and provided with appropriate covering;
- ground water monitoring must be performed at ash disposal sites;
- liners must be utilized at all ash disposal facilities. Liner and disposal recommendations are as follows:
 - for fly ash disposed of separately, disposal should be at a monofill with a double liner system;
 - for combined ash or bottom ash disposed in a monofill, either a composite (thick plastic) liner or a clay liner with special environmental or operating features should be utilized; and
 - for combined ash or bottom ash codisposed with garbage, a double liner should be utilized or a composite liner with pre-disposal ash treatment or source separation to reduce metals content prior to combustion. ■



VI. SANITARY LANDFILLS

Modern sanitary landfills are the result of careful planning, engineering, monitoring and supervision. Federal, state and sometimes local regulations must be met and permits obtained from health and environmental officials. Additionally, the permitting process involves review of construction plans and safety features.

Modern landfill design features include liners, leachate collection and removal systems, methane gas controls, and environmental monitoring systems. In some cases, waste-water treatment plants, recycling facilities and energy production plants are also incorporated.

Sanitary landfills provide a final resting place for most solid and non-hazardous residential, commercial and industrial wastes. There are 9,300 solid waste landfills operating today (6,000 are municipally owned). According to the U.S. Conference of Mayors, more than half of these will face closure within 10 years. Currently 75-80% of municipal solid waste is disposed of in landfills. While new technologies are gaining popularity, there will always be a need for the landfill, to dispose of nonrecyclables and ash from combustion.

Prior to the mid-1970's many landfills were basically open dumps and allowed to receive hazardous waste. In 1976 the Resource Conservation and Recovery Act (RCRA) was passed by Congress to protect human health and the environment from improper waste management practices. RCRA classified landfills and regulates what types of waste they may receive.

Site suitability is determined by a number of factors including careful analysis of the surface and subsurface geology, hydrogeology, the nature of adjacent environments, access routes and proximity to waste generation sources. It requires particularly careful analysis of ground water sources and flow direction, along with soil composition and site engineering. Only after a potential site passes the stringent legal, environmental and engineering criteria in all these areas can work begin in the elaborate preparation required for a modern sanitary landfill operation.

The bottom and sides of a landfill are lined with layers of compacted clay and/or thick plastic liners to insure that any liquid which enters the excavation is retained. Landfill sites are designed so that all rain or snow which falls on the site is retained, collected and treated before release. A network of drains collect the liquid (leachate) that has percolated through the wastes and directs it to recovery points where it is collected for treatment.

Within a typical landfill site, the area for waste disposal is divided into a series of individual cells. In daily disposal activities, only a small portion of the site (known as the "working face") is used, minimizing exposure to wind and rain. At the conclusion of each day's activities, a layer of earth (known as "daily cover") is spread across the compacted waste to minimize odor and prevent insect and vermin problems. Daily cover may consist of soil, foam material, or sheets of synthetic material. Each cell is filled and capped off with a layer of clay and earth and seeded with native grasses according to an approved closure plan.



Development of a modern landfill can take five or more years from the time of site selection to the completion of engineering designs, permit applications and public hearings.

Methane Gas Recovery

As waste decomposes it produces methane gas, which can be explosive, and carbon dioxide. As cells are capped off, venting systems are used to control methane from diffusing underground. Equipment can be installed to collect the gas, dry and treat it for use as a commercial fuel or for the generation of electricity. It also may be burned in a controlled fashion at the landfill site to prevent emission to the atmosphere.

When landfills reach capacity they are sealed and covered with a final cap of clay and dirt. Control of water infiltration, thus the generation of leachate, is a major consideration in landfill cover design. Post closure monitoring of ground water continues for many years.

Completed landfills vary in usage from ski slopes to parking lots, golf courses to parks. They have been landscaped and blended in with their surroundings, or have been specially developed to provide a recreational asset to the community. Completed landfills are generally not used as building sites due to the potential settling of the fill over time.

DEGRADABILITY

Many citizens and legislators are looking to degradability to solve the nation's solid waste disposal dilemma, believing that the degradation of materials will increase the capacity of landfills. However, current research is demonstrating that bio/photodegradation does not have a significant effect on the volume of solid waste.

Biodegradation

Biodegradation occurs when micro-organisms such as fungi or bacteria secrete enzymes that chemically break down material that they then eat or digest. Certain plastic products, generally those in sheet form (bags and packaging), can be produced with additives – such as corn starch or vegetable oil – to enhance the biodegradation process when they come in contact with the bacteria in the soil.

Generally, these bags are less durable and considerably more expensive than the traditional plastic bag. Additionally, there is little current information available on the resulting products and their environmental effect when degradation is enhanced. Another concern is the effect on plastics recycling. If degradable plastic is mixed with other plastics it may have an adverse effect on the recycled product.

Effect on Landfills

Research shows that a 65% moisture level is necessary for a significant rate of biodegradation to occur. However, solid waste entering landfills typically contains 25% to 30% moisture. Landfills are kept dry to prevent the generation of leachate and the possible contamination of ground water.

Food waste and paper products that are over ten years old have been found completely intact in landfills. The U.S. Bureau of Mines has found newspapers that could be read after 60 years of burial.

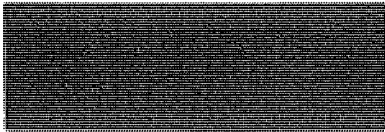
Photodegradation

Photodegradation of plastic is the process whereby the sun's ultraviolet radiation attacks the link in the polymer chain. The breaking of this link causes the plastic chain to fragment into smaller pieces, losing its strength and ability to flex and stretch. As the photodegradable plastic is subjected to the effects of the natural environment, the material is flexed, stretched and disintegrated into plastic dust.

Like biodegradation, photodegradation is also enhanced by the use of additives. Carbonyl additives absorb ultraviolet radiation, thus breaking down the long molecules in plastics. An example of its use is for six-pack ring carriers. Depending upon the duration and intensity of exposure to sunlight, carriers degrade within several months.

Effect on Landfills

For items buried in landfills, photodegradability is not an issue because there is no light. The effect of photodegradability on litter is also a concern. Since litter is a behavioral problem, the effect of telling people that the sun will dissolve plastic bags left on the roadside may encourage, rather than discourage, a littered landscape. Additionally, if the littered item is blown or thrown in the shade, it will not photodegrade in a short period of time. ■



VII.

GLOSSARY

Biodegradable Material: Waste material which is capable of being broken down, usually by bacteria, into basic elements. Most organic wastes, such as food remains and paper, are biodegradable.

Composting: The controlled biological decomposition of organic solid waste under aerobic (in the presence of oxygen) conditions. Organic waste materials are transformed into soil amendments such as humus or mulch.

Integrated Solid Waste Management: A practice of disposing of solid waste that utilizes several complementary components, such as source reduction, recycling, composting, waste-to-energy, and landfill.

Leachate: A liquid resulting from precipitation percolating through landfills containing water, decomposed waste and bacteria. In sanitary landfills leachate is collected and treated to prevent contamination of water supplies.

Municipal Solid Waste: Includes non-hazardous waste generated in households, commercial establishments, institutions, and light industrial wastes; it excludes industrial process wastes, agricultural wastes, mining wastes and sewage sludge.

Photodegradable: A process whereby the sun's ultraviolet radiation attacks the link in the polymer chain of plastic. The breaking of this link causes the plastic chain to fragment into smaller pieces, losing its strength and ability to flex and stretch. As the photodegradable plastic is subjected to the effects of the natural environment, the material is flexed, stretched and disintegrated into plastic dust.

Recycling: A resource recovery method involving the collection and treatment of a waste product for use as raw material in the manufacture of the same or another product (e.g., ground glass used in the manufacture of new glass).

Resource Recovery: A term describing the extraction and utilization of materials which can be used as raw materials in the manufacture of new products, or as values which can be converted into some form of fuel or energy source. An integrated resource recovery program may include recycling, waste-to-energy, composting, and/or other components.

Sanitary Landfill: A method of disposing of refuse on land without creating nuisances or hazards to public health or safety. Careful preparation of the fill area, including the use of clay and/or synthetic liners and control of water drainage are required to assure proper landfilling. To confine the refuse to the smallest practical area and reduce it to the smallest practical volume, heavy equipment is used to spread, compact and cover the waste daily with at least six inches of compacted dirt. After the area has been completely filled and covered with a final two- or three-foot layer of dirt and seeded with grass, the reclaimed land may be turned into a recreational area such as a park or golf course. Sanitary landfills have leachate collection systems, methane gas controls and environmental monitoring systems.

Solid Waste Management: The systematic administration of activities which provide for the collection, source separation, storage, transportation, transfer, processing, treatment, and disposal of solid waste.

Source Separation: The segregation of various materials from the waste stream at the point of generation for recycling. For example, householders separating paper, metal and glass from the rest of their wastes.

Source Reduction: Refers to reducing the amount of waste generated that must eventually be discarded, including minimizing toxic substances in products, minimizing volume of products and extending products' useful life. Requires manufacturers and consumers to take an active role in reducing the amount of waste that is produced.

Waste-to-Energy Incineration: Disposal method where municipal solid waste is brought to a plant where it is either burned, as received, or after being processed to a more uniform fuel, to generate steam or electricity. Waste-to-energy plants can decrease volume by 60-90% while recovering energy from discarded products. Mass burn, modular combustion units and refuse-derived fuel are the three basic waste-to-energy plants used, and over 100 are currently in operation in the U.S. ■



1 Bonding provisions for Authority WPP92

3 NOTE: The following is the most complete set of bonding
language from the proposals to the committee. Several provide
5 no separate language for Authority bonding and rely on
assumption of district's financing authority

7
9 Article 4.

11 Revenue Obligation Securities
Mortgage Loans

13 §1767-A. Definitions

15 As used in this article, unless the context otherwise
17 indicates, the following terms have the following meanings.

19 1. Bond. "Bond" means revenue obligation security.

21 2. Cost of project. "Cost of project" means the cost or
value of land, buildings, real estate improvements, labor,
23 materials, machinery and equipment, property rights, easements,
25 franchises, financing charges, interest, engineering and legal
services, plans, specifications, surveys, cost estimates,
27 studies and other expenses as may be necessary or incidental to
the development, construction, acquisition, financing and
29 placing in operation of an eligible project. In addition to
these costs, reserves for payment of future debt on any revenue
obligation securities may be included as part of the cost of
the project.

31 Any obligation or expenses incurred by the State, the
33 authority, a district, a municipality or any private person in
connection with any of the items of cost specified in this
35 subsection related to revenue obligation securities may be
included as part of the cost and reimbursed to the State, the
37 authority, district, municipality or person out of the proceeds
of the securities issued.

39 3. Eligible collateral. "Eligible collateral" means an
41 eligible project.

43 4. Eligible project. "Eligible project" means any waste
facility or the capital costs of any waste disposal service
45 including, but not limited to, real property, personal
property, machinery and equipment and related expenses.

47 5. Facility. "Facility" means an eligible project or
49 eligible collateral.

51 6. Financial document. "Financial document" means a
lease, installment sale agreement, conditional sale agreement,
53 note, mortgage, loan agreement or other instrument pertaining
to an extension of financial assistance.

1 7. Financing assistance. "Financing assistance" or
2 "financial assistance" means guarantees, leases, insurance,
3 financing credits, loans or the purchase or discounts thereof,
4 letters of credit, financing assistance payments, grants or
5 other financial aid.

7 8. Financing institution. "Financing institution" or
8 "financial institution" means any bank, trust company, national
9 banking association, savings bank, savings and loan
10 association, federal savings and loan association, industrial
11 bank, mortgage company, insurance company, credit union, local
12 development corporation or any other institution or entity
13 authorized to do business in this State, or any state or
14 federal agency which customarily provides financing assistance.

15 9. Lease. "Lease" means a contract providing for the use
16 of a project or portions of a project for a term of years for a
17 designated or determinable rent. A lease may include an
18 installment sales contract. A lease may include other terms as
19 the authority may permit or require.

21 10. Lessee. "Lessee" means a tenant under a lease and may
22 include an installment purchaser.

25 11. Loan. "Loan" or "mortgage loan" means an extension of
26 credit made in consideration of a written promise of repayment
27 or any other conditions which may be established by the
28 authority performance of which may be secured by a mortgage.

29 12. Maturity date. "Maturity date" means the date on
30 which final payment is due as provided in a note, revenue
31 obligation security or other financial document.

33 13. Mortgage. "Mortgage" means an agreement granting a
34 lien on, or a security interest in, eligible collateral with
35 certain conditions and includes, but is not limited to, a
36 mortgage of real estate, an assignment of rents, a pledge or a
37 security agreement.

39 14. Mortgagee. "Mortgagee" means a grantee or obligee
40 under, or a transferee or successor of a grantee or obligee
41 under, a mortgage.

43 15. Mortgage payments. "Mortgage payments" means payments
44 required by or received on account of a mortgage or any other
45 financial document, including, but not limited to, payments
46 covering interest, installments of principal, taxes,
47 assessments, loan insurance premiums and hazard insurance
48 premiums.

51 16. Mortgagor. "Mortgagor" means the grantor or party
52 giving rights to eligible collateral pursuant to a mortgage and
53 includes the successors or assigns of a mortgagor.

1 17. Note. "Note" means an evidence of indebtedness and
3 includes a revenue obligation security.

5 18. Rent or rental. "Rent or rental" means payments under
7 a lease.

9 19. Revenue obligation security. "Revenue obligation
11 security" or "security" means a note, bond, interim
13 certificate, debenture or other evidence of indebtedness
15 payment of which is secured by a pledge of revenues, as
17 provided in this article or by assignment or pledge of other
19 eligible collateral.

21 §1767-B. General powers

23 The authority may, in addition to its other powers and in
25 furtherance of the purposes of this chapter, assist itself or
27 applicants, who may be persons, partnerships, corporations,
29 private or public, except as provided in this chapter,
31 municipalities and districts, in the financing of eligible
33 projects by issuing revenue obligation securities, by issuing
35 or providing securities for mortgage loans, drafting financial
37 documents, trust agreements and other contracts, arranging the
39 financing and negotiating for the sale of the securities. The
41 authority may contract with the Finance Authority of Maine to
43 administer the provisions of this article.

45 The authority may also:

47 1. Kinds of projects. Acquire, construct, reconstruct,
49 maintain, renew, replace or provide financing assistance for
51 eligible waste facilities, waste disposal services or recycling
53 projects, or assist users to acquire, construct, reconstruct,
55 maintain, renew or replace eligible projects;

1 2. Securities for projects. Issue revenue obligation
3 securities to pay the cost of or to provide financial
5 assistance for acquisition, construction, reconstruction,
7 renewal or replacement of eligible projects. Any single issue
9 of securities may provide for the cost of, or for financial
11 assistance for, acquisition, construction, reconstruction,
13 renewal or replacement of any one or more eligible projects
15 which may be separate, unconnected and distinct;

17 3. Acquire securities. Issue revenue obligation
19 securities to acquire one or more issues of revenue obligation
21 securities issued by municipalities or to acquire any other
23 bond not eligible for purchase pursuant to Title 30-A, chapter
25 225. Any single issue of securities may provide funds for the
27 acquisition of revenue obligation securities of one or more
29 municipalities or of bonds for one or more eligible projects
31 which may be separate, unconnected and distinct;

33 4. Refunding securities. Issue revenue refunding
35 obligation securities as provided to refund any outstanding

1 revenue obligation securities issued under this article or to
2 refund any obligations or securities of any municipality;

3
4 5. Serve as broker or agent. Serve as a broker, agent or
5 other financial intermediary for the secondary marketing of
6 obligations issued or incurred in connection with the financing
7 of eligible projects and for the encouragement of the flow of
8 private funds for capital investment;

9
10 6. Facilities. Plan, carry out, acquire, lease and
11 operate facilities and provide for the construction,
12 reconstruction, improvement, alteration or repair of any
13 facility or any part;

14
15 7. Acquisition and disposal of property. Acquire or
16 enable a user to acquire, upon reasonable terms from article 4
17 funds, the lands, structures, property, rights, rights-of-way,
18 franchises, easements and other interests in lands, including
19 lands under water and riparian rights, which are located within
20 the State and deemed necessary or convenient for the
21 construction or operation of any eligible waste project, and
22 dispose of them;

23
24 8. Contracts. Make and enter into all financial documents
25 and other contracts and trust agreements securing revenue
26 obligation securities issued under this article, provided all
27 expenses shall be payable solely from funds made available
28 under this article;

29
30 9. Consent to modification of contracts, lease or
31 agreement. To the extent not forbidden under its contract with
32 the holders of bonds, consent to any modification of any
33 contract, lease or agreement of any kind to which the authority
34 is a party;

35
36 10. Employment of specialists. Employ consulting and
37 other engineers, attorneys, accountants, construction and
38 financial experts, superintendents, managers and other
39 necessary employees and agents and fix their compensation,
40 provided all expenses shall be payable solely from funds made
41 available under this subchapter;

42
43 11. Government contracts. Enter into contracts with
44 districts, municipalities, the State or a federal agency
45 relating to any eligible solid waste project. In the case of
46 contracts involving pollution-control facilities, the consent
47 of the Board of Environmental Protection shall first be
48 obtained, notwithstanding section 362;

49
50 12. Government aid. Accept loans or grants for the
51 planning, construction or acquisition of any eligible solid
52 waste project from a municipality, an authorized agency of the
53 State or a federal agency and enter into agreements with the
54 agency respecting the loans or grants. In the case of all
55 loans, grants or other aid involving pollution-control

1 facilities, the consent of the Board of Environmental
2 Protection shall first be obtained, notwithstanding section 362;

3
4 13. Private aid. Receive and accept aid and contributions
5 from any source of either money, property, labor or other
6 things of value, to be held, used and applied only for the
7 purposes for which these loans, grants and contributions may be
8 made;

9
10 14. Applicability. Provide financial assistance by means
11 of leases which are not subject to Title 14, section 6010.
12 Leases made under this section may provide that obligations of
13 the lessees shall be unconditional;

14
15 15. Application. Provide financial assistance by means of
16 revenue obligation securities which are not subject to Title
17 32, chapter 105, relating to dealers in securities;

18
19 16. Electricity. Provide financial assistance for
20 electricity generating projects. Any district, municipality,
21 firm or corporation producing electricity by means of projects
22 described in subsection 1, or by means of a pollution-control
23 project, facility or combined project may, without the approval
24 of and regulation by the Public Utilities Commission, generate
25 and distribute electricity solely for its own use or the use of
26 its tenant, but may not, without proper approval, sell
27 electricity to other than an electric public utility
28 corporation or cooperative authorized to make, generate, sell
29 and distribute electricity.

30 §1767-C. Issuance of revenue obligation securities

31
32 1. Notice of intent to issue bonds; actions to contest
33 validity. The authority may provide, at one time or from time
34 to time, for the issuance of revenue obligation securities of
35 the authority for the purposes authorized in this chapter. No
36 revenue obligation securities of the authority may be issued
37 until:

38
39 A. The project has been determined to be consistent with
40 state and district solid waste management plans pursuant to
41 section 1765-B and the necessary permits have been obtained
42 from the department.

43
44 B. A notice of the intent of the authority to issue the
45 securities is published at least once in a newspaper of
46 general circulation in the district in which the project is
47 to be located:

48
49 (1) No later than 14 days after the date on which the
50 certification is issued;

51
52 (2) Describing the general purpose or purposes for
53 which the securities are to be issued;

54
55

1 (3) Stating the maximum principal amount of the
2 proposed securities; and

3 (4) Including a statement as to the time within which
4 any petition to contest the issuance of the securities
5 must be commenced.

6
7 Any action or proceeding in any court to contest the issuance
8 of the securities must be started within 30 days after the date
9 of the publication required by paragraph B and otherwise shall
10 be governed by Title 5, chapter 375, subchapter VII. For the
11 purposes of this subchapter and the Maine Administrative
12 Procedure Act, Title 5, chapter 375, the later date of
13 newspaper publication required by paragraph B shall constitute
14 the final agency action with respect to the issuance of the
15 securities. After the expiration of the 30-day period of
16 limitation, no right of action or defense founded upon the
17 invalidity of the issuance of the securities may be opened to
18 question in any court upon any grounds.

19
20 2. Treasurer of State as agent. The Treasurer of State
21 shall, at the direction of the authority, act as the
22 authority's agent for the sale and delivery of revenue
23 obligation securities and anticipatory notes. The Treasurer of
24 State shall assist the authority in the preparation, issuance,
25 negotiation and sale of the securities and notes and provide
26 reasonable advice and management assistance. The authority may
27 employ further counsel or assistants or act in its own behalf,
28 provided that the sale and delivery of revenue obligation
29 securities and anticipatory notes shall be carried out at the
30 authority's direction with and through the Treasurer of State.

31
32 3. Conclusive authorization. All revenue obligation
33 securities of the authority shall be conclusively presumed to
34 be fully authorized and issued under the laws of the State, and
35 any person or governmental unit shall be estopped from
36 questioning their authorization, sale, issuance, execution or
37 delivery by the authority.

38
39 4. Maturity; interest. The securities of each issue of
40 revenue obligation securities shall be dated, mature at a time
41 or times not exceeding 30 years from the date of the securities
42 and bear interest at a rate or rates determined by the
43 authority. At the option of the authority, the securities may
44 be made redeemable before maturity at a price or prices and
45 under terms and conditions fixed prior to issuance.

46
47 5. Form. The authority shall determine the form of the
48 securities, including any attached interest coupons, the manner
49 of execution of the securities, the denomination or
50 denominations of the securities and the place or places for
51 payment of principal and interest, which may be at any
52 financial institution within or without the State. Revenue
53 obligation securities shall be executed in the name of the
54 authority by the manual or facsimile signature of the
55 authority.

1 authorized official or officials. Any attached coupons shall
2 be executed with the manual or facsimile signature of the
3 authorized official or officials. Signatures and facsimiles of
4 signatures on securities and coupons are valid for all purposes
5 even if the authorized official ceases to hold office before
6 delivery of the securities. The securities may be issued in
7 coupon or registered form or both as the authority may
8 determine. Provision may be made for the registration of any
9 coupon securities to principal alone and to both principal and
10 interest, and for the reconversion into coupon securities of
11 any securities registered to both principal and interest. In
12 addition to this subsection, the authority may provide for
13 transfer of registration of the authority's registered revenue
14 obligation securities by book entry on the records of the
15 entity designated for that purpose and may enter into such
16 contractual arrangements as may be necessary to accomplish
17 these purposes. In the event a book entry method of transfer
18 is used, principal of and interest on those registered
19 securities shall be payable to the registered owner shown in
20 the book entry, the owner's legal representatives, successors
21 or transferees.

22 6. Sale. The authority may sell the securities at a
23 public or private sale, in a manner and at a price the
24 authority determines to be in the best interest of the
25 authority. The authority shall not sell the securities to any
26 firm, partnership, corporation or association, including an
27 affiliate or subsidiary, which is a party to any contract
28 pertaining to the financed project or which is to rent,
29 purchase, lease or otherwise occupy premises constituting part
30 of the project. The authority may sell the securities to a
31 seller of the project if the project is to be used and operated
32 by a 3rd party.

33 7. Proceeds. The proceeds of each issue shall be used
34 solely for the authorized purposes and shall be disbursed as
35 provided in the securing trust agreement or other document.
36 Administration costs incurred by the authority under this
37 program may be drawn from those proceeds. If the proceeds are
38 less than the cost of the project, by error in the estimate or
39 otherwise, additional securities may be issued in a like manner
40 to provide the amount of the deficit and, unless otherwise
41 provided in the securing trust agreement or such other
42 document, the additional securities are deemed to be of the
43 same issue and shall be entitled to payment from the same fund
44 without preference or priority of the securities first issued
45 for the same purpose. The authority may place limits or
46 restrictions on the issuance of additional revenue obligation
47 securities through the securing trust agreement or other
48 document. The authority may provide for the replacement of
49 mutilated, destroyed or lost securities. Revenue obligation
50 securities may be issued under this subchapter without
51 obtaining the consent of any department, division, commission,
52 board, bureau or agency of the State and without any other
53 proceedings or the occurrence of any conditions or things other
54 than those specified in this subchapter.

1 than those proceedings, conditions or things which are
2 specifically required by this subchapter. Notwithstanding any
3 of the other provisions of this subchapter, or of any recitals
4 in any securities issued under this subchapter, all such
5 securities are deemed to be negotiable instruments issued under
6 the laws of this State.

7
8 8. Credit not pledged. Except as provided in this
9 subsection, securities issued under this subchapter shall not
10 constitute any debt or liability of the State or of any
11 municipality in the State or any political subdivision of the
12 State, or of the authority or a pledge of the faith and credit
13 of the State or of any such municipality or political
14 subdivision, but shall be payable solely from the revenues of
15 the project or projects for which the securities are issued or
16 from other eligible collateral or the revenues or proceeds of
17 other eligible collateral pledged to the payment of the revenue
18 obligation securities and all such securities shall contain on
19 the securities' face a statement to that effect. The issuance
20 of securities under this subchapter shall not directly or
21 indirectly or contingently obligate the State or any
22 municipality or political subdivision to levy or to pledge any
23 form of taxation whatever or to make any appropriation for
24 payment.

25
26 9. Anticipatory borrowing. In anticipation of the sale of
27 securities under this article, the authority may issue
28 temporary notes and renewal notes, the total face amount of
29 which does not exceed at any one time outstanding, the
30 authorized amount of the securities. The period of
31 anticipatory borrowing shall not exceed 3 years and the time
32 within which the securities are to become due shall not be
33 extended by the anticipatory borrowing beyond the term
34 permitted by law.

35
36 10. Environmental protection. Revenue obligation
37 securities of the authority shall not be issued for a project
38 until the department has certified to the authority that all
39 licenses required by the department with respect to the project
40 have been issued or that none are required. Any subsequent
41 enlargement or addition to the project for which approval is
42 sought from the authority requires certification by the
43 department.

44 §1767-D. Trust agreements or other documents

45
46 1. Trust agreements or other documents. At the discretion
47 of the authority, revenue obligation securities may be issued
48 under this subchapter pursuant to a trust agreement or other
49 document. The trust agreement or other document may:

50
51 A. Pledge or assign the revenues or proceeds of the
52 project or projects or other eligible collateral;
53

1 B. Set forth the rights and remedies of the security
2 holders and other persons and contain any reasonable and
3 legal provisions for protecting the rights and remedies of
4 the security holders;

5 C. Restrict the individual right of action by security
6 holders; and

7 D. Include covenants setting forth the duties of the
8 authority and user in relation to:

9 (1) Acquisition of property or eligible collateral;

10 (2) Construction, reconstruction, renewal, replacement
11 and insurance of the project or eligible collateral;

12 (3) Rents to be charged or other payments to be made
13 for use;

14 (4) Payment for the project or eligible collateral; and

15 (5) Custody, safeguarding and application of all money.

16 Any financial institution may furnish indemnifying bonds or
17 pledge the securities as may be required by the authority.

18 2. Mortgages. To further secure the payment of the
19 revenue obligation securities, the trust agreement or other
20 document may mortgage or assign the mortgage of the project, or
21 any part of the project, and create a lien on or security
22 interest in any or all of the project. In the event of a
23 default with respect to the revenue obligation securities, the
24 trustee, mortgagee or other person may be authorized by the
25 trust agreement or other document containing a mortgage or
26 assignment of a mortgage to take possession of, hold, manage
27 and operate all or any part of the mortgaged property and, with
28 or without taking possession, to sell or from time to time
29 lease the property in accordance with law. Any security
30 interest granted by the authority under this chapter may be
31 created and perfected in accordance with the Uniform Commercial
32 Code, Title 11, Article 9, notwithstanding Title 11, section
33 9-104, subsection 5.

34 3. Additional provisions. Any trust agreement or other
35 document may contain provisions which shall be a part of the
36 contract with holders of revenue obligation securities as to:

37 A. Pledging any specified revenues or assets of the
38 authority to secure the payment of the securities, subject
39 to agreements with existing holders of securities;

40 B. Pledging all or any part of the unencumbered revenues
41 or assets of the authority to secure the payment of
42 securities, subject to agreements with existing holders of
43 securities;

1 C. Setting aside, regulating and disposing of reserves or
2 sinking funds;

3
4 D. Limitations on the purpose to which the proceeds of
5 sale of securities may be applied and the pledge of the
6 proceeds to secure the payment of the securities or of any
7 issue of securities;

8 E. Limitations on the issuance of additional securities;

9
10 F. The terms on which additional securities may be issued
11 and secured and the refunding of outstanding or other
12 securities;

13
14 G. The procedure, if any, by which the terms of any
15 contract with holders of securities may be amended or
16 abrogated, including the proportion of the holders which
17 must consent and the manner in which the consent may be
18 given;

19
20 H. Limitations on the amount of money to be expended by
21 the authority for operating expenses of the authority;

22
23 I. Vesting in a trustee or trustees such property, rights,
24 powers and duties in trust as the authority may determine,
25 which may include any or all of the rights, powers and
26 duties of the trustee appointed by the holders of the
27 securities under this subchapter, and limiting or
28 abrogating the right of the holders of the securities to
29 appoint a trustee under this chapter or limiting the
30 rights, powers and duties of the trustee;

31
32 J. Defining the acts or omissions to act which will
33 constitute a default in the obligations and duties of the
34 authority to the holders of the securities and providing
35 for the rights and remedies of the holders of the
36 securities in the event of default, including, as a matter
37 of right, the appointment of a receiver; but only if the
38 rights and remedies are not inconsistent with the laws of
39 the State and other provisions of the subchapter; and

40
41 K. Any other matters, of like or different character,
42 which in any way affect the security or protection of the
43 holders of the securities.

44
45 4. Expenses; pledges. All expenses incurred in carrying
46 out a trust agreement or financial document may be treated as a
47 part of the cost of the operation of the project. All pledges
48 of revenue or eligible collateral under this subchapter shall
49 be valid and binding from the time when the pledge is made.
50 All the revenues or eligible collateral pledged and later
51 received by the authority shall immediately be subject to the
52 lien of the pledges without any physical delivery or further
53 action under the Uniform Commercial Code or otherwise. The
54 lien of the pledges shall be valid and binding against all
55

1 parties having claims of any kind in tort, contract or
2 otherwise, against the authority, irrespective of whether the
3 parties have notice thereof.

5 5. Other provisions. A trust agreement or financial
6 document may contain other provisions the authority deems
7 reasonable and proper for the security of the security holders.

9 §1767-E. Rentals and revenues

11 1. Provisions. Before issuing revenue obligation
12 securities, the authority shall determine that there will at
13 all times be revenues and funds sufficient:

15 A. To pay the principal and interest of the securities as
16 they become due and payable and, in its discretion, to
17 create and maintain reserves for that purpose; and

19 B. To pay the cost of maintaining and, where applicable,
20 repairing the project unless provision is made in the
21 financial document or other contract for maintenance and,
22 where applicable, repair.

23 2. Sinking fund. All project rentals and other revenues,
24 except those required in subsection 1, paragraph B or to
25 provide reserves for maintenance and, where applicable, repair,
26 may be set aside at regular intervals as provided in the trust
27 agreement or other document and deposited to the credit of a
28 sinking fund charged with payment of the interest and principal
29 of the securities as they fall due, any necessary charges of
30 paying agents for paying principal and interest, and the
31 redemption price or the purchase price of securities retired by
32 call or purchase. To use the disposition of money to the
33 credit of the sinking fund shall be subject to regulations
34 prescribed in the trust agreement or other document. Except as
35 may otherwise be provided in the trust agreement or other
36 document, the sinking fund shall be a fund for the benefit of
37 all securities issued for the project or projects without
38 distinction or priority of one over another.

41 3. Trust funds. All money received under this subchapter
42 shall be deemed trust funds, to be held and applied solely as
43 provided in this subchapter. Any officer to whom, or any bank,
44 trust company or other fiscal agency or trustee to which the
45 money shall be paid shall act as trustees of the money and
46 shall hold and apply it for the purposes of this subchapter,
47 subject to the requirements of this subchapter, the trust
48 agreement or other applicable document.

49 §1767-F. Remedies

51 Any holder of revenue obligation securities or coupons
52 issued under this subchapter and the trustee under any trust
53 agreement, except as restricted by the trust agreement or
54 applicable document, may, by appropriate legal action, protect
55

1 and enforce any and all rights under the laws of this State or
2 granted under this subchapter, the trust agreement or other
3 document, including the appointment of a receiver, and may
4 enforce and compel the performance of all duties required by
5 this subchapter, the trust agreement or other document to be
6 performed by the authority, including the collecting of rates,
7 fees and charges for the use of the project. Any proceeding
8 shall be brought for the benefit of all holders of the
9 securities and any coupons.

11 §1767-G. Revenue refunding securities

13 The authority may provide for the issuance of revenue
14 refunding securities of the authority to refund any outstanding
15 revenue securities issued under this subchapter or under
16 subchapter IV or to refund any obligations or securities of any
17 municipality, including the payment of any redemption premiums
18 and any interest accrued or to accrue to the date of
19 redemption, and, if deemed advisable for the authority, to
20 construct or enable the construction of improvements,
21 extensions, enlargements or additions of the original project.
22 The authority may provide for the issuance of revenue
23 obligation securities of the authority for the combined purpose
24 of refunding any outstanding revenue obligation securities or
25 revenue refunding securities issued under this subchapter or to
26 refund any obligations or securities of any municipality,
27 including the payment of redemption premiums and interest
28 accrued or to accrue and paying all or any part of the cost of
29 acquiring or constructing or enabling the acquisition or
30 construction of any additional project or part of any
31 improvements, extensions, enlargements or additions of any
32 project. The issuance of the securities, the maturities and
33 other details, the rights and remedies of the holders and the
34 rights, powers, privileges, duties and obligations of the
35 authority shall be governed by the provisions of this
36 subchapter insofar as they are applicable.

37 §1767-H. Tax exemption

39 Revenue obligation securities issued under this article
40 shall constitute a proper public purpose and the securities,
41 their transfer and the income from them, including any profits
42 made on their sale, shall at all times be exempt from taxation
43 within the State, whether or not those securities, their
44 transfer or the income from them, including any profits on
45 their sale, are subject to taxation under the United States
46 Internal Revenue Code.

49 §1767-I. Leasehold or other interests of lessee taxable

51 The interest of the user of any project is subject to
52 taxation in the manner provided for similar interests in Title
53 36, section 551, subject to Title 36, sections 655 and 656.

1 §1767-J. Bonds as legal investments

3 The revenue obligation securities of the authority and any
5 loan or extension of credit issued under this article, shall be
7 legal investments in which all public officers and public
9 bodies of the State, its political subdivisions, all districts
11 and municipalities and municipal subdivisions, all insurance
13 companies and associations and other persons carrying on an
15 insurance business, all banks, bankers, banking associations,
17 trust companies, savings banks and savings associations,
19 including savings and loan associations, building and loan
21 associations, investment companies and other persons carrying
23 on a banking business, all administrators, guardians,
25 executors, trustees and other fiduciaries and all other persons
who are not or may later be authorized to invest bonds or other
obligations of the State, may properly and legally invest
funds, including capital, in their control or belonging to
them. The revenue obligation securities and any loan or
extension of credit which is issued under this subchapter are
also made securities, which may properly and legally be
deposited with the received by all public officers and bodies
of the State or any agency or political subdivisions and all
municipalities and public corporations for any purpose for
which the deposit of bonds or other obligations of the State is
now or may later be authorized by law.

27 §1767-K. Capital reserve funds; obligation of State

29 1. Capital reserve fund. The authority may create and
31 establish one or more capital reserve funds and may pay into
33 any such capital reserve fund any money appropriated and made
35 available by the State for the purposes of any such fund, any
37 proceeds of sale by the authority of revenue obligation
39 securities to the extent determined by the authority and any
41 other money available to the authority. For purposes of this
section, the amount of any letter of credit, insurance
contract, surety bond, indemnification agreement or similar
financial undertaking available to be drawn on and applied to
obligations to which money in any such fund may be applied
shall be deemed to be and counted as money in the capital
reserve fund.

43 2. Application. Money in any capital reserve fund created
45 pursuant to subsection 1, except as provided in this section,
47 shall be used solely with respect to revenue obligation
49 securities or mortgage loans, repayment of which is secured by
51 any such fund and solely for the payment of principal, accrued
53 interest and costs and expenses chargeable to the mortgage loan
or securities, the purchase or redemption of the securities,
including any fees or premiums or the payment of interest on
the securities. Money in excess of the reserve requirement set
forth in subsection 3 may be transferred to other funds and
accounts of the authority.

1 3. Reserve requirement. The authority may provide that
2 money in any such fund shall not be withdrawn at any time in an
3 amount which would reduce the amount of any such fund to less
4 than the maximum amount of principal and interest becoming due
5 and payable under any applicable trust agreement or other
6 agreement in the next succeeding 12-month period, the amount
7 being referred to as the capital reserve requirement, except
8 for the purpose of paying the amount due and payable with
9 respect to revenue obligation securities or mortgage loans,
10 repayment of which is secured by any such fund.

11 4. Issuance limit. The authority may provide that it
12 shall not issue revenue obligation securities if the capital
13 reserve requirement with respect to securities outstanding and
14 then to be issued and secured by any such fund will exceed the
15 amount of any such fund, including the amount available to be
16 drawn on any letter of credit given to secure the capital
17 reserve requirement, at the time of issuance, unless the
18 authority, at the time of issuance of the securities, shall
19 deposit in any such fund from proceeds of the securities to be
20 issued, or from other sources, an amount, which, together with
21 the amounts then in any such fund and amounts available to be
22 drawn under any letter of credit, will not be less than the
23 capital reserve requirement.

24 5. Security for mortgage loans. With respect to any
25 mortgage loans which may be secured under this article, the
26 authority may provide that such mortgage loans shall be secured
27 by one or more capital reserve funds established pursuant to
28 subsection 1. Any commitment with respect to a mortgage loan
29 executed and delivered pursuant to this section shall be
30 conclusive evidence of the eligibility of the mortgage loan for
31 capital reserve fund security and the validity of any such
32 commitment or contract shall be incontestable in the hands of a
33 mortgage lender except for fraud or misrepresentation on the
34 part of the mortgage lender. Mortgages secured by capital
35 reserve funds under this section are made legal investments for
36 all insurance companies, trust companies, banks, investment
37 companies, savings banks, savings and loan associations,
38 executors, trustees and other fiduciaries, public and private
39 pension or retirement funds and other persons.

40 6. Appropriation. On or before December 1st, annually,
41 the authority shall certify to the Governor the amount, if any,
42 necessary to restore the amount in any capital reserve fund, to
43 which this subsection is stated in any written agreement, the
44 trust agreement or other document to apply, to the capital
45 reserve requirement. The Governor shall pay directly from the
46 State Contingent Account to any such fund as much of the amount
47 as is available in that account, as determined by the Governor,
48 and shall transmit directly to the Legislature certification
49 and a statement of the amount, if any, remaining to be paid.
50 The certified amount shall be appropriated and paid to the
51 authority during the current state fiscal year.

1 7. Obligations and securities outstanding. The authority
2 shall not have at any one time outstanding obligations or
3 revenue obligation securities to which subsection 6 is stated
4 in any agreement or the trust agreement or other document to
5 apply in principal amount exceeding an amount equal to
6 \$50,000,000. The amount of revenue obligation security issued
7 to refund securities previously issued shall not be taken into
8 account in determining the principal amount of securities
9 outstanding, provided that proceeds of the refunding securities
10 are applied as promptly as possible to the refunding of the
11 previously issued securities. In computing the total amount of
12 revenue obligation securities of the authority which may at any
13 time be outstanding for any purpose, the amount of the
14 outstanding revenue obligation securities that have been issued
15 as capital appreciation bonds or as similar instruments shall
16 be valued as of any date of calculation at their then current
17 accrued value rather than their face value.

19 §1767-L. Taxable bond option

21 With respect to all or any portion of any issue of any
22 bonds or any series of bonds which the authority may issue in
23 accordance with the limitations and restrictions of this
24 subchapter, the authority may covenant and consent that the
25 interest on the bonds shall be includable, under the United
26 States Internal Revenue Code of 1954 or any subsequent
27 corresponding internal revenue law of the United States, in the
28 gross income of the holders of the bonds to the same extent and
29 in the same manner that the interest on bills, bonds, notes or
30 other obligations of the United States is includable in the
31 gross income of the holders under the United States Internal
32 Revenue Code or any subsequent law. The foregoing grant of
33 power shall not be construed as limiting the inherent power of
34 the State or its agencies under any other provision of law to
35 issue debt, the interest on which is includable in the gross
36 income of the holders of the interest under the United States
37 Internal Revenue Code or any subsequent law.

39

1 Bonding provisions for districts

2 The following district bonding provisions is similar to that in
3 other proposals except that the others do not include municipal
4 guarantee of district's bonds.

5

6 §1762-E. Bonds and notes in general

7

8 1. Authorization of bonds. Subject to the limitations in
9 subsection 10 and section 1762-H, any district may provide by
10 resolution of its board of directors for the borrowing of money
11 and the issuance from time to time of bonds and notes for any
12 of its corporate purposes, including, but not limited to:

13

14 A. Paying and refunding its indebtedness;

15

16 B. Paying any necessary expenses and liabilities incurred
17 under this Act, including organizational and other
18 necessary expenses and liabilities, whether incurred by the
19 district or any municipality in the district. The district
20 may reimburse any municipality in the district for any such
21 expenses incurred or paid by that municipality;

22

23 C. Paying costs directly or indirectly associated with
24 acquiring properties, paying damages, constructing,
25 maintaining and operating waste facilities, making
26 renewals, additions, extensions and improvements to the
27 property or facilities and covering interest payments
28 during the period of construction or for such period as the
29 directors may determine;

30

31 D. Providing reserves for debt service, repairs and
32 replacements or other capital or current expenses as may be
33 required by a trust agreement or resolution securing bonds
34 or notes;

35

36 E. Financing all or part of a waste facility for a user.
37 As used in this section, "user" means one or more persons
38 or entities other than a district, acting as lessee,
39 purchaser, mortgagor, borrower or contracting party; and

40

41 F. Any combination of these purposes.

42 Bonds may be issued by a district under this subchapter as
43 general obligations of the district or as special obligations
44 payable solely from particular funds. The principal, premium
45 and interest on all bonds shall be payable solely from funds
46 provided for that purpose from revenues. All bonds issued by a
47 district under this subchapter shall be legal obligations of
48 the district, and all districts formed under this subchapter
49 are declared to be quasi-municipal corporations under Title
50 30-A, section 5701. Bonds may be issued under this subchapter
51 without obtaining the consent of any commission, board, bureau
52 or agency of the State or of any municipality encompassed by
53 the district and without any other proceedings, conditions or
54 things other than those proceedings, conditions or things which
55

1 are specifically required by this Act. Except as provided in
3 this subchapter, bonds issued by a district do not constitute a
5 debt or liability of the State or any municipality encompassed
7 by the district or constitute a pledge of the faith and credit
9 of the State or any such municipality. A statement to this
11 effect shall be recited on the face of the bonds.

13 2. Notes. Any district formed under this subchapter may
15 also provide by resolution of its board of directors, without
17 district vote, for the issuance from time to time of notes in
19 anticipation of:

21 A. Bonds authorized under this Act;

23 B. The revenues to be collected or received in any year;
25 or

27 C. The receipt of federal or state grants or other aid.
29 The issuance of these notes shall be governed by the
31 applicable provisions of this Act relating to the issuance
33 of bonds, provided that notes in anticipation of revenue
35 must mature no later than one year from their respective
37 dates and notes issued in anticipation of federal or state
39 grants or other aid and renewals thereof must mature no
41 later than the expected date, as determined by the board of
43 directors, of receipt of those grants or aid. The board of
45 directors may adjust the maturity date of notes issued in
47 anticipation of federal or state grants or other aid to
49 reflect changes in the expected date of receipt. Notes in
51 anticipation of revenue issued to mature less than one year
53 from their dates may be renewed from time to time by the
55 issuance of other notes, provided that the period from the
date of an original note to the maturity of any note issued
to renew or pay the note or the interest thereon may not
exceed one year.

37 Any such district may enter into agreements with the State or
39 the United States, or any agency of either, or any
41 municipality, corporation, commission or board authorized to
43 grant or loan money or to otherwise assist in the financing of
45 projects of the type which that district is authorized to carry
47 out, and to accept grants and borrow money from any such
49 government, agency, municipality, corporation, commission or
51 board as may be necessary or desirable to accomplish the
53 purposes of the district.

47 3. Maturity; interest; form; temporary bonds. The bonds
49 issued under this Act shall be dated, shall mature at such time
51 or times not exceeding 40 years from their date or dates and
53 shall bear interest at such rate or rates as may be determined
55 by the board of directors or determined pursuant to a formula
approved by the board of directors or by a 3rd party
rate-setting agent selected by the board of directors, and may
be made redeemable before maturity, at the option of the
district, at such price or prices and under such terms and

1 conditions as may be fixed by the board of directors prior to
2 the issuance of the bonds. The board of directors shall
3 determine the form of the bonds, including any interest coupons
4 to be attached, and the manner of execution of the bonds, and
5 shall fix the denomination or denominations of the bonds and
6 the place or places of payment of principal and interest which
7 may be at any financial institutions having trust powers within
8 or without the State. Bonds shall be executed in the name of
9 the district by the manual or facsimile signature of an officer
10 or officers authorized in the resolution to execute the bonds,
11 but at least one signature on each bond shall be a manual
12 signature. Coupons, if any, attached to the bonds shall be
13 executed with the facsimile signature of the officer or
14 officers of the district designated in the resolution. In case
15 any officer whose signature or facsimile signature appears on
16 any bonds or coupons ceases to hold that office before the
17 delivery of the bonds, the signature or its facsimile shall
18 nevertheless be valid and sufficient for all purposes, as if
19 the officer had remained in office until the delivery.
20 Notwithstanding any other provisions of this Act or any
21 recitals in any bonds issued under this Act, all such bonds
22 shall be deemed to be negotiable instruments under the laws of
23 this State. The bonds may be issued in coupon or registered
24 form, or both, as the board of directors may determine, and
25 provision may be made for the registration of any coupon bonds
26 as to principal alone and as to both principal and interest,
27 and for the reconversion into coupon bonds of any bonds
28 registered as to both principal and interest. The board of
29 directors may sell the bonds either at public or private sale
30 and for such price as it determines is in the best interests of
31 the district. The proceeds of the bonds of each issue shall be
32 used solely for the purpose for which those bonds have been
33 authorized and shall be disbursed in such manner and under such
34 restrictions as the board of directors may provide in the
35 resolution authorizing the issuance of the bonds or in the
36 trust agreement securing the bonds. The resolution providing
37 for the issuance of bonds and any trust agreement securing the
38 bonds may contain such limitations upon the issuance of
39 additional bonds as the board of directors determines proper
40 and these additional bonds shall be issued under such
41 restrictions and limitations as may be prescribed by that
42 resolution or trust agreement. Prior to the preparation of
43 definitive bonds, the board of directors may, under like
44 restrictions, issue interim receipts or temporary bonds, with
45 or without coupons, exchangeable for definitive bonds when
46 those bonds are executed and available for delivery. The board
47 of directors may provide for the replacement of any bond that
48 is mutilated, destroyed or lost.

49
50 4. Pledges and covenants; trust agreement. In the
51 discretion of the board of directors of any district, each or
52 any issue of bonds may be secured by a trust agreement between
53 the district and a corporate trustee which may be any financial
54 institution having trust powers within or without the State.

55

1 The resolution of the directors authorizing the issuance of the
2 bonds or the trust agreement may pledge or assign, in whole or
3 in part, the revenues and other money held or to be received by
4 the district and any accounts and contracts or other rights to
5 receive the revenues or money, whether then existing or
6 thereafter coming into existence and whether then held or
7 thereafter acquired by the district and the proceeds thereof,
8 and may convey or mortgage the waste facilities or any other
9 properties of the district. The resolution may also contain
10 provisions for protecting and enforcing the rights and remedies
11 of the bondholders, including, but not limited to, covenants
12 setting forth the duties of the district and the board of
13 directors in relation to the acquisition, construction,
14 reconstruction, improvement, repair, maintenance, operations
15 and insurance of waste facilities or any other properties; the
16 fixing and revising of rates, tolls, assessments, rents,
17 tipping fees, transportation charges and other charges; the
18 application of the proceeds of bonds; the custody, safeguarding
19 and application of revenues; and the defining of defaults and
20 providing for remedies in the event thereof, which may include
21 the acceleration of maturities, the establishment of reserves
22 and the making and amending of contracts. The resolution or
23 trust agreement may set forth the rights and remedies of the
24 bondholders and of the trustee, if any, and may restrict the
25 individual right of action by bondholders as is customary in
26 trust agreements or trust indentures securing bonds or
27 debentures of corporations. In addition, the resolution or
28 trust agreement may contain such other provisions as the board
29 of directors may deem reasonable and proper for the security of
30 the bondholders, including means by which the resolution or
31 trust agreement may be amended. All expenses incurred in
32 carrying out the resolution or trust agreement may be treated
33 as a part of the cost of operation. The pledge by any such
34 resolution or trust agreement shall be valid and binding and
35 shall be deemed continuously perfected for the purposes of the
36 Uniform Commercial Code from the time that the pledge is made.
37 All revenues, money, rights and proceeds so pledged and
38 thereafter received by the district shall immediately be
39 subject to the lien of the pledge without any physical delivery
40 or segregation thereof or further action under the Uniform
41 Commercial Code, or otherwise, and the lien of the pledge shall
42 be valid and binding as against all parties having claims of
43 any kind in tort, contract or otherwise against the district
44 regardless of whether those parties have notice thereof.

45 The resolution authorizing the issuance of bonds under this
46 Act, or any trust agreement securing those bonds, may provide
47 that all or a sufficient amount of revenues and assessments,
48 after providing for the payment of the cost of repair,
49 maintenance and operation and reserves therefor as provided in
50 the resolution or trust agreement, shall be set aside at such
51 regular intervals as provided in the resolution or trust
52 agreement and deposited in the credit of a fund for the payment
53 of the interest on and the principal of bonds issued under this
54 Act as the bonds shall become due and the redemption price or
55

1 purchase price of bonds retired by call or purchase. The use
2 and disposition of money in or to the credit of the fund shall
3 be subject to such regulations as may be provided in the
4 resolution authorizing the issuance of the bonds or in the
5 trust agreement securing the bonds and, except as may otherwise
6 be provided in the resolution or trust agreement, the fund
7 shall be a fund for the benefit of all bonds without
8 distinction or priority of one over another.

9
10 5. Trust funds. Notwithstanding any other provision of
11 law, all money set aside for payment of the bonds, or other
12 purposes pursuant to the provisions of any trust agreement
13 securing the bonds, shall be deemed to be trust funds to be
14 held and applied as provided by the trust agreement, provided
15 that investment or deposit of those funds shall be subject to
16 the provisions applicable to municipal funds under Title 30-A,
17 chapter 223, subchapter III-A. The resolution authorizing the
18 issuance of bonds or the trust agreement securing the bonds
19 shall provide that any officer to whom, or bank, trust company
20 or other financial institution or fiscal agent to which, money
21 shall be paid shall act as trustee of money and shall hold and
22 apply the money for these purposes, subject to such regulations
23 as may be provided in the resolution or trust agreement or as
24 may be required by this Act.

25
26 6. Remedies. Any holder of bonds issued under this Act or
27 of any of the coupons pertaining to those bonds, and the
28 trustee under any trust agreement, except to the extent the
29 rights given may be restricted by the resolution authorizing
30 the issuance of those bonds or trust agreement, may, either at
31 law or in equity, by suit, action, mandamus or other
32 proceedings for the appointment of a receiver to take
33 possession and control of the properties of the district,
34 protect and enforce all rights under the laws of the State or
35 granted under this Act or under the resolution or trust
36 agreement and may enforce and compel the performance of all
37 duties required by this Act or by the resolution or trust
38 agreement to be performed by the district or by any officer of
39 the district, including the fixing, charging and collecting of
40 rates, fees and charges for the use of or for the services and
41 facilities furnished by the district or, if applicable, the
42 making of any assessments against member municipalities under
43 section 1756.

44
45 7. Refunding bonds. Any district formed under this Act by
46 resolution of its board of directors, without district vote,
47 may issue refunding bonds for the purpose of paying any of its
48 bonds at maturity or upon acceleration or redemption. The
49 refunding bonds may be issued at such time prior to the
50 maturity or redemption of the refunded bonds as the board of
51 directors deems to be in the public interest. The refunding
52 bonds may be issued in sufficient amounts to pay or provide the
53 principal on the bonds being refunded, together with any
54 redemption premium on the bonds, any interest accrued or to
55 accrue to the date of payment of those bonds, the expenses of

1 issuance of the refunding bonds, the expenses of redeeming the
2 bonds being refunded and such reserves for debt service or
3 other capital or current expenses from the proceeds of the
4 refunding bonds as may be required by a trust agreement or
5 resolution securing bonds. The issuance of refunding bonds,
6 the maturities and other details thereof, the security
7 therefor, the rights of the holders thereof and the rights,
8 duties and obligations of the district in respect of the same
9 shall be governed by the applicable provisions of this Act
10 relating to the issuance of bonds other than refunding bonds.

11
12 8. Tax exemption. All bonds, notes or other evidences of
13 indebtedness issued under this Act, their transfer and the
14 income therefrom, including any profit made on the sale
15 thereof, shall at all times be free from taxation within the
16 State.

17
18 9. Bonds declared legal investments. Bonds and notes
19 issued by any district under this Act are made securities in
20 which all public officers and public bodies of the State and
21 its political subdivisions, all insurance companies,
22 associations and other persons carrying on an insurance
23 business, trust companies, banks, bankers, banking
24 associations, savings banks and savings associations, including
25 savings and loan associations, credit unions, building and loan
26 associations, investment companies, executors, administrators,
27 trustees and other fiduciaries, pension, profit-sharing,
28 retirement funds, other persons carrying on a banking business
29 and all other persons who are now, or may hereafter be,
30 authorized to invest in bonds or other obligations of the
31 State, may properly and legally invest funds, including capital
32 in their control or belonging to them. The bonds and notes are
33 made securities which may properly and legally be deposited
34 with and received by any state, municipal or public officer or
35 any agency or political subdivision of the State for any
36 purpose for which the deposit of bonds or other obligations of
37 the State is authorized by law.

38 10. Certain bond issues; notice; special meeting; vote.
39 In the event that the directors vote to authorize bonds or
40 notes for any of the corporate purposes of a district,
41 excluding notes payable within one year, notes in anticipation
42 of the revenues to be collected or received in any year, notes
43 in anticipation of bonds which have already been authorized in
44 accordance with this Act or notes in anticipation of the
45 receipt of approved federal or state grants, the authorized
46 amount of which, singly or in the aggregate included in any one
47 financing, is \$1,000,000 or more, the directors shall:

48
49 A. Provide notice to the general public of the proposed
50 bond or note issue and the purposes for which the debt is
51 being incurred; and

52
53 B. Call a special district meeting for the purpose of
54 permitting the collection of testimony from the public
55

1 concerning the amount of the debt so authorized. Notice of
2 the proposed bond or note issue, the purposes for which the
3 debt is being issued and the call of the special meeting
4 shall be published at least once in a newspaper having
5 general circulation in the district.

6
7 No debt may be incurred under the vote of the directors until
8 the expiration of 7 full days following the date on which the
9 special district meeting was held. If, prior to the expiration
10 of that period, a petition signed by at least 5% but not less
11 than 50 of the registered voters of the district is filed with
12 the clerk of the district requesting reference of the vote of
13 the directors to referendum, the clerk of the district shall
14 call and hold a special election of the voters of the district
15 for the purpose of submitting to referendum vote the question
16 of approving the vote of the directors. The vote of the
17 directors shall be suspended until it has received approval by
18 vote of a majority of the voters of the district voting on the
19 question at the special election.

20
21 11. Negotiated or competitive bidding process. Any notes,
22 bonds or other instruments of indebtedness may be the subject
23 of a negotiated or competitive bidding process, or any other
24 process which may be advantageous to the district, and
25 determination of the process to be used shall be made by and at
26 the discretion of the directors of the district.

27 §1762-F. Fees and charges

28
29 All persons, firms and corporations, whether public,
30 private or municipal, shall pay to the treasurer of any
31 district designated under this subchapter the rates, tolls,
32 assessments, rents, tipping fees, transportation charges and
33 other fees or charges established by the directors for services
34 provided by the district. In this subchapter, the term "other
35 fees or charges" includes, but is not limited to, interest on
36 delinquent accounts at a rate not to exceed the highest lawful
37 rate set by the Treasurer of State for municipal taxes. The
38 district may submit periodic bills directly to individual users
39 or to member municipalities, as determined by the directors.

40
41 A district may establish schedules of fees and charges by
42 any method determined by the directors. Fees and charges are
43 subject to the provisions of subchapter VI, article 1.

44
45 The rates, tolls, assessments, rents, tipping fees,
46 transportation charges and other fees or charges shall be
47 established to provide revenue at least sufficient, together
48 with any other money available, to:

49
50
51 1. Current operating expenses. Pay the current expenses of
52 operating and maintaining the waste facilities of the district;

53
54 2. Payment of interest and principal. Pay the principal,
55 premium and interest on all bonds and notes issued by the

1 district under this Act when due and payable;

3 3. Payments into reserve funds. Create and maintain such
4 reserves as may be required by any trust agreement or
5 resolution securing bonds and notes;

7 4. Repairs, replacements and renewals. Provide funds for
8 paying the cost of all necessary repairs, replacements and
9 renewals of the waste facilities of the district; and

11 5. Payment of obligations. Pay or provide all amounts
12 which the district may be obligated to pay or provide by law or
13 contract, including any resolution or contract with or for the
14 benefit of the holders of its bonds and notes.

15 §1762-G. Collection of unpaid charges

17 The treasurer of the district may collect the rates, tolls,
18 assessments, rents, tipping fees, transportation charges and
19 other charges established by the district and those charges
20 shall be committed to the treasurer of the district. The
21 treasurer may, after demand for payment, sue in the name of the
22 district in a civil action for any rate, toll, rent,
23 assessment, tipping fee, transportation charge or other charges
24 remaining unpaid in any court of competent jurisdiction. In
25 addition, the treasurer may order the termination of service
26 for nonpayment of any amount owed to the district.

29 §1762-H. Guarantee by municipalities of district bonds and
30 notes

31 1. Guarantee of bonds and notes. Subject to approval by a
32 vote of the inhabitants of the district to be held in
33 accordance with Title 30-A, section 2528, the district board of
34 directors may provide by resolution for the issuance, at one
35 time or from time to time, of guaranteed notes and bonds of the
36 district for any purpose for which the district may issue
37 debt. Except as otherwise provided, notes and bonds issued by
38 the district in accordance with this section shall be
39 authorized, issued and sold in the same manner as and shall be
40 subject to the other provisions of this subchapter relating to
41 notes and bonds. The principal, premiums, if any, and interest
42 on notes and bonds issued under this section shall be
43 guaranteed by the member municipalities of the district and the
44 full faith and credit of the member municipalities shall be
45 pledged for the guarantee provided in this section. The share
46 of liability of each member municipality for the guaranteed
47 notes and bonds shall be established in accordance with a
48 fraction, the numerator of which is the most recent state
49 valuation of all property within the member municipality and
50 the denominator of which is the most recent total state
51 valuation of all property located within the member
52 municipalities of the district.

55 2. Application of guarantee. The guarantee provided for

1 under this section shall apply to notes and bonds of the
2 district designated by the district board of directors under
3 subsection 1.

5

PACKAGING BANS AND PROHIBITIONS

Enacted earlier: LD 351: An Act to Prohibit the Use of Plastic Beverage Stirrers in State Facilities.

BEVERAGE RELATED PACKAGING

§1868. Prohibition on certain types of containers and holders

No beverage ~~container~~ shall be sold or offered for sale to consumers in this State:

1. **Flip tops.** In a metal container designed or constructed so that part of the container is detachable for the purpose of opening the container without the aid of a separate can opener; ~~and~~

2. **Connectors.** ~~Which~~ In containers connected to each other by plastic rings or other plastic holding device, which does not decompose by photodegradation, chemical degradation or biodegradation within a reasonable period of time upon exposure to the elements/; and

3. **Plastic cans.** In a container composed of one or more plastics if the basic structure of the container, exclusive of the closure device, also includes aluminum or steel.

§1868. Prohibition on certain types of containers and holders

No beverage ~~container/which~~ may be sold or offered for sale to consumers in this State:

1. **Flip tops.** In a metal container designed or constructed so that part of the container is detachable for the purpose of opening the container without the aid of a separate can opener; ~~and~~

2. **Connectors.** ~~Which~~ In containers connected to each other by plastic rings or other plastic holding ~~device/ which does not decompose by photodegradation, chemical degradation or biodegradation within a reasonable period of time upon exposure to the elements/~~ devices;

3. **Plastic cans.** In a container composed of one or more plastics if the basic structure of the container, exclusive of the closure device, also includes aluminum or steel; and

4. **Aseptic beverage packs.** In a container composed of aseptic packaging composed of aluminum, paper and plastic, in combination thereof, where those materials are for practical reasons inseparable, and commonly referred to as a "brick-pack."

PLASTIC BAGS

§1604. Plastic carry-out bags

1. Definitions. As used in this section, unless the context otherwise indicates, the following terms have the following meanings.

A. "Plastic carry-out bag" means any bag made of synthetic or natural polymerized resins, including polyethylene, used by the consumer to transport purchased goods from the retail or commercial establishment that provides the bag.

2. Prohibitions. All retail and commercial establishments in this State shall provide paper carry-out bags to customers for the purpose of carrying purchases unless the consumer specifically requests a plastic carry-out bag. In addition:

A. After January 1, 1990, no retail or commercial establishment in this State may sell or provide plastic carry-out bags unless those bags are recycled in this State at a sustained rate of 50% as determined by the Office of Waste Recycling and Reduction; and

B. After January 1, 1990, all plastic carry-out bags shall be composed of one type of plastic only and labeled with the name of that plastic.

§1606. Plastic bags

After January 1, 1990, all retailers in Maine shall use paper bags to bag products at the point of retail sale unless the consumer requests a plastic bag.

POLYSTYRENE BAN

Sec. 1. 38 MRSA §1652, as enacted by PL 1987, c. 804, is repealed.

Sec. 2. 38 MRSA §1652-A is enacted to read:

§1652. Sales of food or beverages in polystyrene foam containers

A food service providing or serving individual portions of food or a beverage shall not provide or serve those portions in or on containers that are composed in whole or in part of polystyrene foam plastic.

Sec. 3. Effective date. This Act shall take effect on January 1, 1990.

Comment: HCFC-22 is available and being used as a blowing agent in food service polystyrene products. Some HCFC compounds being considered as CFC substitutes have been disqualified because preliminary testing indicated unacceptable toxicity. One chemical producer will not use HCFC-22 as an aerosol in personal care products because of some adverse toxicological testing results. In addition, some non-halogen substitutes for CFC may present hazards to workers or create other environmental hazards. Overall, the impact from use of CFC substitutes remains unclear.

PACKAGING CONTENT

LD 1431

§1605. Heavy metal contamination

After July 1, 1991, no person may sell or offer to sell in this State any packaging containers or materials using lead or cadmium as a stabilizer or pigment.

PLASTIC CONTAINER CODING

CHAPTER 26

CODING OF PLASTIC CONTAINERS

§1721. Definitions

As used in this chapter, unless the context otherwise indicates, the following terms have the following meanings.

1. Beverage. "Beverage" means any liquid produced or packaged for internal human consumption. Beverage includes, but is not limited to, water, ale, beer, spirits, soda water, and other carbonated and noncarbonated liquids.

2. Container. "Container" means any bottle, can, jar, case, package or other receptacle intended to hold, carry, and enclose beverages, food items or nonfood products.

3. Rigid plastic container. "Rigid plastic container" means a container made of synthetic or natural polymerized resins or cellulose derivatives including, but not limited to, all materials listed in section 1723, which retains the same shape whether full or empty.

§1722. Coding of plastic containers

On or after January 1, 1991, no person may distribute, sell, or offer for sale any rigid plastic container unless that container has a molded label indicating the type of plastic resin used to produce the rigid plastic container.

§1723. Labels

1. Labels. The label shall appear on the bottom of the rigid plastic container and be clearly visible. This label shall consist of a number with letters placed below the number. The numbers and letters shall be as follows:

A. For polyethylene terephthalate, the letters "PETE" and the number 1;

B. For high-density polyethylene, the letters "HDPE" and the number 2;

C. For vinyl, the letter "V" and the number 3;

CONSENSUS LANGUAGE IN ALL LDs

The industry recommendation for this symbol has been changed to "PETt".

D. For low-density polyethylene, the letters "LDPE" and the number 4;

E. For polypropylene, the letters "PP" and the number 5;

F. For polystyrene, the letters "PS" and the number 6; or

G. For any other plastic resins, including multilayer, the letters "OTHER" and the number 7.

No counterpart language

No counterpart language

No counterpart language

§1724. Pharmaceutical exemption

Any rigid plastic container with a volume of 8 ounces or less which is used to package pharmaceutical products is exempt from this chapter.

Recycling Arrows, Multiplastic, Penalty change

Multiresin vs. multilayer question.

G. For any other plastic resins, including containers composed of more than one resin, the letters "OTHER" and the number 7.

2. Ancillary symbols. Labels utilizing a chasing arrow symbol or any other configuration of arrows to indicate recyclable materials or products with recycled content shall be limited to products meeting the specifications established by the Office of Waste Reduction and Recycling, Maine Waste Management Authority pursuant to section 1725.

3. Multiplastic containers. Polyethylene terephthalate containers with affixed high-density polyethylene base cups shall be labeled with the letters, "PETE," and the number 1. Any other rigid plastic container where affixed materials and additives other than the single plastic resin used in the container structure exceeds 2% by weight of the total container shall be labeled with the letters, "OTHER" and the number 7.

§1725. Standard for recyclability and recycled content

The Office of Waste Reduction and Recycling, Maine Waste Management Authority shall establish standards by rule for recyclability and for recycled content for which the chasing arrow symbol may be used.

The industry recommendation is to place the code on bottles of 16 or more ounces and on "rigid plastic containers" of 8 or more ounces. The industry definition of "rigid plastic container" excludes bottles.

§1725. Penalties

1. Civil violation. A violation of this chapter shall be a civil violation for which a forfeiture of not more than \$100 may be adjudged.

2. Separate violation. Each day that a violation continues or exists shall constitute a separate offense.

§1726. Rules and enforcement

The Department of Economic and Community Development, Office of Waste Reduction and Recycling shall adopt and enforce rules implementing the provisions of this chapter. In adopting rules the office shall consult with the Recycling Advisory Council, the Department of Agriculture, Food and Rural Resources, plastic container manufacturers and distributors, and the recycling industry. Rules shall be adopted in accordance with the provisions of Title 5, chapter 375.

§1726. Penalties

1. Civil violation. A violation of this chapter shall be a civil violation for which a forfeiture of not more than \$100 may be adjudged.

2. Separate violation. Each container constitutes a separate offense.

§1726. Rules and enforcement

The Maine Solid Waste Management Authority shall adopt and enforce rules implementing the provisions of this chapter. In adopting rules, the authority shall consult with the Department of Agriculture, Food and Rural Resources, plastic container manufacturers and distributors and the recycling industry. Rules shall be adopted in accordance with the provisions of the Maine Administrative Procedure Act, Title 5, chapter 375.

§1764-J. Plastics

1. Coding of plastics. The office shall adopt and enforce rules implementing a program for the coding of plastics pursuant to Title 32, chapter 26.

1 WPP93

3 COLUMN 1 LD 932
FEES

5
General fee authority for the Authority

7 (§1761-D)
2. Charge fees for waste disposal
9 services. Charge fees as just and reasonable
11 for the planning, design, construction,
13 operation and other related costs of waste
15 facilities and waste disposal services provided
17 by the authority or provided by the authority on
19 behalf of one or more districts;

17 General fee authority for districts
(§1762-D)

19 7. Rates and charges. A district may
21 establish and collect rates and charges for the
23 facilities and services provided by the district
25 and may negotiate and collect rates and charges
for facilities and services contracted for by
the district. Rates and charges shall be
subject to subchapter VI, article 1.

27 Specific fee authority
29 SUBCHAPTER VI

31 FINANCE, FEES AND CONTRACTS

33 Article 1.

35 Fees and Contracts

37 §1766-A. Just and reasonable fees

39 The authority and the districts shall
41 establish just and reasonable fees for waste
disposal services provided by the authority or
any district.

COLUMN 2 LD 1431
FEES

General fee authority for the Authority
(§2102, sub-§1)

H. Establish and collect fees, assessments
and other charges and expend money received
as provided in this chapter;

General fee authority for districts
(§2142, sub-§1)

G. Establish and collect fees, assessments
and other charges and expend money received
as provided in this chapter;

Specific fee authority for district (Authority
may assume powers of district)
§2151. Setting fees and other charges

The district board may from time to time
establish and adjust a structure for fees,
including penalty charges, for collection
services and transportation and for disposal of
solid waste in and upon facilities operated by,
on behalf of or under contract with, the
district, subject to section 2166.

§2153. Surplus revenues

COLUMN 3 LD 1548
FEES

General fee authority for the Authority
(§2104)

8. Fees. Establish and collect fees,
assessments and other charges and expend money
received as provided in this chapter;

Specific fee authority for the Authority
SUBCHAPTER III

FEES AND BUDGETS

§2131. Fees and other charges

The authority shall establish, by rule, fees
and other charges sufficient to fund the costs
of all solid waste disposal activities required
by this chapter, including sufficient reserves
to cover the costs of operation, including debt
payment, closing and post-closure monitoring of
the facility and any cost of reasonably

§1766-B. Purposes of the fees

The fees established by the authority or the districts pursuant to this Act shall provide revenue for the following purposes:

1. Current expenses. To pay the current expenses, either directly incurred or through contractual agreements with another party or parties, for operating and maintaining the facility or delivering the service and to provide for normal maintenance and replacement of equipment;

2. Interest. To provide for the payment of interest on the indebtedness created or assumed by the authority or district;

3. Indebtedness. To provide an annual sum equal to not less than 2% nor more than 10% of the term indebtedness represented by the issuance of bonds created or assumed by the authority or the district, which sum shall be turned into a sinking fund and there maintained to provide for the extinguishment of term indebtedness. The money set aside in this sinking fund shall be devoted to the retirement of the term obligations of the authority or district and may be invested in such securities as savings banks in the State are allowed to hold;

4. Principal payments. To provide for annual principal payments on serial indebtedness created or assumed by the authority or district;

5. Contingency reserve fund allowance. To provide for a contingency reserve fund allowance by providing rates to reflect up to a 5% addition to yearly revenues over what is required to operate the facility;

If, at the end of any fiscal year, the district has realized a surplus from operations for the fiscal year, after payment of or provision for all current expenses, current maintenance, repairs and replacements, current debt service on all outstanding bonds and notes of the district, all reserves for debt service, repairs and replacements, costs or current expenses as may be required by a trust agreement or resolution securing bonds or notes or as may otherwise be maintained by the district, and any other amounts which the district may be obligated by law or contract to pay or provide for, the district shall either:

1. Reduction in charges. Apply the surplus in the following fiscal year to a reduction in the rates, fees, rents or other charges established by the district for services provided; or

2. Reduction of capital debt. Apply the surplus to the reduction or provision for reduction of its outstanding capital debt.

foreseeable remedial activity. All users of a solid waste disposal facility shall be assessed a user fee. The authority may design its fee structure to provide incentives for recycling and waste reduction.

§2132. Obligations of the authority; use of revenue

1. Payment. All expenses incurred in carrying out this chapter shall be paid solely from funds provided in accordance with this chapter and no obligation may be incurred beyond the extent to which money has been provided in accordance with this chapter.

2. Limitation on expenditures. Expenditure of all revenues received by the authority shall be limited to the purposes of this chapter.

§2133. Grants

The authority may accept and expend for any of the purposes of this chapter grants or donations of money, equipment, supplies, materials and services from the United States or a political subdivision of the United States, this State or a political subdivision of this State, any other state or a political subdivision of any other state, any interstate agency or any person.

§2134. Supplemental fee

Except for costs attributable to negligence by the authority or its contractors, if the cost of post-closure care and long-term institutional control, including mitigation of any environmental problems that may develop at the site, exceeds the available funds, including enforcement of a judgment, federal assistance and the reserve for contingencies provided in

1
3 6. Closing reserve fund. To provide for a
5 closing reserve fund by providing rates which
7 over the expected life span of the facility will
9 generate the amount determined to be necessary
11 by the department in its licensing process; and

13
15 7. Compliance costs. To provide for the
17 costs associated with licensing, compliance and
19 enforcement efforts of the department.

21 §1765-C. Uniform fees

23
25 The authority and the districts shall
27 establish fees which are uniform within the
29 region receiving waste disposal services except
31 as follows.

33
35 1. Regional costs in excess of average. If
37 the cost of construction and maintenance or the
39 cost of service in a section of the region
41 exceeds the average, the district or the
43 authority may establish higher fees for that
45 section, but these higher fees shall be uniform
47 throughout that section.

49
51 2. Host community. The authority or the
53 district may set fees for the host community at
55 a level lower than the fees charged to other
57 communities or users, provided that such lower
59 fees are set in a manner consistent with the
61 rules promulgated by the authority.

63
65 3. Extra-district fees. Districts may set
67 fees to be paid by other districts at a level
69 higher than the fees paid by communities within
71 the territorial jurisdiction of the district
73 providing the waste disposal services, provided
75 that higher fees are set in a manner consistent
77 with the rules promulgated by the authority.

section 2131, the authority may assess
generators of solid waste a supplemental fee to
cover that cost, in proportion to the volume of
the waste generated by each generator which
remains in the waste stream. If any owner pays
more than that owner's proportional share of the
costs under this subsection, that owner shall
have a cause of action to recover that excess
from other owners who paid less than their share.

§2135. Solid Waste Facility Fund

There is created a nonlapsing, revolving
fund known as the Solid Waste Facility Fund to
be used to pay for the planning, siting,
construction, operation, maintenance, closure
and post-closure costs of facilities undertaken
by the authority and the administrative and
operational costs of the authority.

1. Revenue deposited. Unless otherwise
provided, all revenue collected by the authority
or the disposal facility to be used for
planning, siting, construction, operation,
maintenance, closure and post-closure costs of a
disposal facility and administrative and
operational costs of the authority shall be
deposited in the Solid Waste Facility Fund. All
other funds received by the authority whether by
grant, gift, appropriation or other means shall
also be deposited in the fund.

2. Expenditure of funds. Unless otherwise
provided, all activities described in this
chapter, including administrative and
operational costs of the authority, shall be
funded from the Solid Waste Facility Fund.
Expenditures from the fund shall not require
allocation by the Legislature.

1 §1766-D. Filing of fees and contracts

3 Every district shall file with the
5 authority, within a time to be fixed by the
7 authority by rule, the following:

9 1. Schedules of fees. Schedules of fees
11 for any waste disposal service performed by the
13 district or contracted for by the district; and

15 2. Contracts. All contracts between any
17 district and a commercial waste facility or a
19 commercial operator.

21 The schedules and contracts filed pursuant
23 to this section shall be open for public
25 inspection at the authority. The schedule of
27 fees for waste disposal services performed by
29 the authority, or contracted for by the
31 authority, shall also be open for public
33 inspection.

35 §1766-E. Review of fees

37 The authority shall be authorized to review
39 and approve all fee schedules filed pursuant to
41 section 1766-D to determine if the schedules
comply with the rules promulgated pursuant to
section 1766-H, subsections 1 to 4.

§1766-F. Review and approval of contracts

The authority shall have the authority to
review and approve contracts between districts
and commercial waste facilities or commercial
operators to determine if the terms of the
contract are just and reasonable and are
consistent with the rules established pursuant
to section 1766-H, subsections 1 to 4. The
authority shall hold a hearing to review the

3. Surplus revenues. Surplus revenues in
the Solid Waste Facility Fund shall be carried
forward and used to reduce the assessments or
fees for the following year.

1 contracts whenever a hearing is requested by
2 either the district or the commercial waste
3 facility or commercial operator or on its own
4 initiative.

5
6 §1766-G. Hearings and appeals

7
8 The authority shall establish rules
9 governing the procedures for hearings and
10 appeals pursuant to sections 1766-E, 1766-F,
11 1766-K and 1766-L. The provisions of the Maine
12 Administrative Procedure Act, Title 5, chapter
13 375, shall apply to this article.

14 §1766-H. Rules

15
16 The authority shall establish rules which
17 set forth the following:

18
19 1. Contingency reserve fund. Various
20 contingencies for which the fund must be
21 expended, the methodology for determining the
22 amount to be maintained in the fund and those
23 conditions which will require expenditures of
24 the money contained in the fund;

25
26 2. Closing reserve fund. Various
27 contingencies for which the fund must be
28 expended, a methodology for determining the
29 amount to be maintained in the fund and those
30 conditions which will require expenditure of the
31 money contained in the fund;

32
33 3. Fees charged to host communities.
34 Criteria to be used in determining any reduction
35 in fees charged to host communities;

36
37 4. Fees charged by one district to another
38 district. Criteria to be used in determining
39 the fees to be charged by one district to
40 another district; and

1 5. Contracts between districts and
 commercial waste facilities or commercial
3 operators. Criteria by which contracts will be
 reviewed by the authority.

5

1 COLUMN 1 LD 932
OTHER REVENUES

COLUMN 2 LD 1431
OTHER REVENUES

COLUMN 3 OTHER BILLS
OTHER REVENUES

3

5 State fees on certain items

No counterpart for Fund

No substantially different proposals

Article 2.

7

Maine Solid Waste Management Fund

9

11 §1766-I. Maine Solid Waste Management Fund
established

13 The Maine Solid Waste Management Fund,
referred to in this section as the fund, is
15 established as a nonlapsing fund to support
programs administered by the Solid Waste
17 Management Authority and the Department of
Environmental Protection. All fees established
19 under this article shall be credited to the
fund, and administrative expenses directly
21 related to the authority's and the department's
programs shall be charged to the fund.

23

Money in the fund not currently needed to
25 meet the obligations of the authority shall be
deposited with the Treasurer of State to the
27 credit of the fund and may be invested as
provided by law. Interest on these investments
29 shall be credited to the fund.

31 Money in the fund sufficient to meet the
administrative costs of the department as
33 allocated by the Legislature shall be
transferred to the Maine Environmental
35 Protection Fund on a quarterly basis.

37 Money in the fund may only be expended in
accordance with allocations approved by the
39 Legislature. These allocations shall be based
on estimates of the actual costs necessary for
41 the authority and the department to administer
its programs, to provide financial assistance to

1 districts and to provide other financial
2 assistance necessary to accomplish the purposes
3 of this chapter. Allowable expenditures include
4 Personal Services, All Other and Capital
5 Expenditures associated with planning, finance
6 and technical services, licensing, enforcement
7 and compliance activities.

9 §1766-J. Fees

11 1. Fees established. The authority shall
12 establish procedures to charge only those fees
13 specified in this article and pursuant to the
14 requirements of this article. All fees
15 collected by the authority shall be deposited
16 into the Maine Solid Waste Management Fund.

17
18 2. Application. Fees established under
19 this article become effective on October 1,
20 1989, with the first payment due on January 20th.

21 §1766-K. Fee on special waste

22
23 There are imposed fees of the following
24 amounts to be levied per ton or per cubic yard
25 for special waste processed at resource recovery
26 facilities and for all special waste from a
27 resource recovery facility that is disposed of
28 at commercial, municipal, district or state
29 landfills. The fee shall be paid by the
30 operator of each municipal landfill and resource
31 recovery facility in the same manner provided
32 for in section 1766-L for municipal solid waste.

33
34 Asbestos
35 \$2

36
37 Oil spill debris
38 \$4

39
40 Waste water facility sludge
41 \$2

1 Ash, coal and oil

3 \$4

5 Paper mill sludge

7 \$1

9 Industrial waste

11 \$6

13 Sandblast grit

15 \$6

17 Miscellaneous special waste

19 \$4

21 Municipal solid waste ash

23 \$6

25 §1766-L. Municipal solid waste fee

27 There is imposed a fee for all solid waste
29 processed at resource recovery facilities and
31 for all solid waste except process residue and
33 nonprocessible waste from a resource recovery
35 facility that is disposed of at commercial,
37 municipal, district or state landfills.

39 1. Fee calculation. The fee shall be paid
41 by the operator of each municipal, district or
43 state landfill and resource recovery facility.
45 The fee shall be calculated in one of 2 ways:

47 A. For operators of landfills and resource
49 recovery facilities that weigh solid waste
51 when it is received, the fee shall be \$1.50
53 per ton of waste; or

55 B. For operators of landfills that do not
57 weigh solid waste when it is received, the
59 fee shall be calculated as if 3 cubic yards
61 were equal to one ton of solid waste.

§1766-M. Disposal fees

Alternative to disposal fees - Advance disposal fees

There are imposed fees on the following hard to dispose of items delivered to resource recovery facilities or commercial, municipal, district or state landfills. The fee shall be paid by the operator of each landfill and resource recovery facility.

Sec. 1. 5 MRSA §1665 is amended by adding at the end a new paragraph to read:

In preparing estimates of expenditure and appropriation requirements for each fiscal year of the ensuing biennium for the Maine Waste Management Authority, the Bureau of the Budget shall recommend to the Governor an amount to support the activities of that agency pursuant to Title 38, chapter 24, which shall be no less than the amount of General Fund revenues estimated to be received from the advance disposal tax, as established in Title 36, chapter 719, and from the waste stream products tax as established in Title 36, chapter 720, for each year of the ensuing biennium.

Sec. 2. 36 MRSA c. 719 is enacted to read:

CHAPTER 719

SOLID WASTE ADVANCE DISPOSAL TAX

§4831. Definitions

As used in this chapter, unless the context otherwise indicates, the following terms have the following meanings.

1. Brown good. "Brown good" means an electronic device containing printed circuit boards, capacitors, resistors or transistors that is not included in the definition of white goods and that weighs more than 10 pounds.

2. Business. "Business" means any trade, occupation, activity or enterprise engaged in

Tires
\$2.00

Lead-acid batteries
\$1.50

White goods
\$10.00

Brown goods
\$10.00

§1766-N. Fee payments

Each operator of a landfill or resource recovery facility shall make the fee payment quarterly. The fee shall be paid on or before the 20th day of April, July, October and January for the 3 months ending the last day of March, June, September and December.

1. Quarterly reports. Each fee payment shall be accompanied by a form prepared and furnished by the authority and completed by the operator. The form shall state the total weight or volume of solid waste received by the facility during the payment period and provide any other aggregate information deemed necessary by the authority to carry out the purposes of this chapter. The form shall be signed by the operator.

2. Timeliness of payment. The operator shall be deemed to have made a timely payment of the fee if the operator complies with all of the following:

A. The enclosed payment is for the full amount owed pursuant to this section and no further authority action is required for collection;

B. The payment is accompanied by the required form and the form is complete and accurate; and

C. The letter transmitting the payment that is received by the authority is postmarked by the United States Postal Service on or prior to the final day on which the payment is to be received.

3. Discount. Any operator that makes a timely payment of the fee as provided in this section shall be entitled to credit and apply against the fee payable, a discount of 1% of the amount of the fee collected.

4. Refunds. Any operator who believes the fee was overpaid by the operator may file a petition for refund to the authority. If the authority determines that the operator has overpaid the fee, the authority shall refund to the operator the amount due the operator, together with interest at a rate established by the authority.

5. Alternative proof of payment. For purposes of this section, presentation of a receipt indicating that the payment was mailed by registered or certified mail on or before the due date shall be evidence of timely payment.

selling or distributing tires, white goods, brown goods or lead-acid batteries in this State.

3. Distributor. "Distributor" means any of the following:

A. A person engaged in the business of producing or manufacturing tires, white goods, brown goods or lead-acid batteries in this State for sale in this State;

B. A person engaged in the business of selling tires, white goods, brown goods or lead-acid batteries in this State who brings, or causes to be brought, into this State any tires, white goods, brown goods or lead-acid batteries for sale to a retailer; or

C. A person engaged in the business of selling tires, white goods, brown goods or lead-acid batteries who ships or transports tires, white goods, brown goods or lead-acid batteries to retailers for sale in this State.

4. Lead-acid battery. "Lead-acid battery" means a device designed and used for the storage of electrical energy through chemical reactions involving lead and acids.

5. Manufacturer. "Manufacturer" means a person who manufactures and sells tires, white goods, brown goods or lead-acid batteries.

6. Motorized vehicle. "Motorized vehicle" means any self-propelled vehicle, including motorcycles, construction and farm vehicles and other off-road vehicles, not operating exclusively on tracks.

6. Interest. If an operator fails to make a timely payment of the fee, the operator shall pay interest on the unpaid amount due at the rate established by the authority, from the last day for timely payment to the date paid.

7. Additional penalty. In addition to the interest provided in subsection 8, if an operator fails to make timely payment of the fee, there shall be added to the amount of fee actually due 5% of the amount of the fee, if the failure to file a timely payment is for not more than one month, with an additional 5% for each additional month, or fraction of a month, during which the failure continues, not exceeding 25% in the aggregate.

8. Assessment notice. If the authority determines that any operator has not made a timely payment of the fee, the authority will send the operator a written notice of the amount of the deficiency, within 30 days of determining the deficiency. When the operator has not provided a complete and accurate statement of the weight or volume of waste received at the facility for the payment period, the authority may estimate the weight or volume in the notice.

The operator charged with the deficiency shall have 30 days to pay the deficiency in full or, if the operator wishes to contest the deficiency, forward the amount of the deficiency to the authority for placement in an escrow account with the Treasurer of State or any bank in the State, or post an appeal bond in the amount of the deficiency. The bond shall be executed by a surety licensed to do business in the State and be satisfactory to the authority. Failure to forward the money or appeal bond to the authority within 30 days shall result in a waiver of all legal rights to contest the deficiency.

7. Place of business. "Place of business" means any place where tires, white goods, brown goods or lead-acid batteries are sold or where tires, white goods, brown goods or lead-acid batteries are manufactured, stored or kept for the purpose of sale.

8. Retailer. "Retailer" means any person engaged in the business of selling tires, white goods, brown goods or lead-acid batteries to ultimate consumers.

9. Retail outlet. "Retail outlet" means a place of business from which tires, white goods, brown goods or lead-acid batteries are sold to consumers.

10. Sale. "Sale" means a transfer, exchange, barter or gift in any manner or by any means for a consideration. It shall include a gift for advertising by a person engaged in the business of selling tires, white goods, brown goods or lead-acid batteries.

11. Tire. "Tire" means the device made of rubber or any similar substance which is intended to be attached to a motorized vehicle or trailer and is designed to support the load of the motor vehicle or trailer.

12. Trailer. "Trailer" means any vehicle without motive power that may be drawn by a motorized vehicle.

13. Unclassified importer. "Unclassified importer" means any person, firm, corporation or association within this State, other than a distributor, as defined in subsection 3, who imports, receives or acquires from outside the State, tires, white goods, brown goods or lead-acid batteries for use or sale within the State.

1 If, through the administrative or judicial
3 review of the deficiency, it is determined that
the amount of deficiency shall be reduced, the
5 authority shall within 30 days remit the
appropriate amount to the operator, with any
7 interest accumulated by the escrow deposit.

9 The amount determined after administrative
hearing or after waiver of administrative
11 hearing shall be payable to the authority and
shall be collectible.

13 If any amount due under this subsection remains
15 unpaid 30 days after receipt of notice of the
deficiency, the authority may order the operator
17 of the facility to cease receiving any solid
waste until the amount of the deficiency is
19 completely paid.

21 9. Filing of appeals. Notwithstanding any
other provision of law, all appeals of final
23 authority actions concerning the fee shall be
filed with the authority pursuant to section
25 1766-G.

14. White good. "White good" means any
appliance employing electricity, natural gas or
any liquified petroleum gas to supply heat or
motive power:

A. To preserve or cook food;

B. To wash clothing, dishes, kitchen
utensils, glasses or other related items; or

C. To cool or heat air or water.

§4832. Licenses

A person engaging in the business of selling
tires, white goods, brown goods or lead-acid
batteries as a distributor shall secure a
license from the State Tax Assessor before
engaging in that business. A license
application shall be made on a form prescribed
by the State Tax Assessor and shall state the
name and address of the applicant, address of
the applicant's principal place of business and
such other information as the State Tax Assessor
may require for the proper administration of
this chapter. The application shall be
accompanied by a fee of \$25. A person outside
the State who ships or transports tires, white
goods, brown goods or lead-acid batteries to
retailers in this State shall make application
as a distributor and be granted by the State Tax
Assessor a license subject to all the provisions
of this chapter and agrees, upon applying for a
license, to submit that person's books, accounts
and records to examination by the Bureau of
Taxation during reasonable business hours and to
accept service of process by mail when service
is made in any proceeding involving enforcement
of this chapter.

1 An unclassified importer before importing,
3 receiving or acquiring tires, white goods, brown
 goods or lead-acid batteries from outside the
5 State shall secure a license from the State Tax
 Assessor. There is no fee for that license.

7 An issued license expires on July 31st of
9 each year unless it is revoked earlier by the
 State Tax Assessor. The license shall be
11 prominently displayed on the premises covered by
 the license and no license may be transferred to
13 another person.

15 The State Tax Assessor may revoke or suspend
 the license or licenses of any person for
17 violation of this chapter. A license may not be
 revoked, cancelled or suspended until after
19 notice and hearing by the State Tax Assessor.

21 §4833. Solid waste advance disposal tax on
 tires, white goods,
23 brown goods or lead-acid batteries

25 1. Solid waste advance disposal tax. A
 solid waste advance disposal tax is imposed on
27 the sale of:

29 A. Tires at the rate of \$1 per tire;

31 B. White goods at the rate of \$15 per white
 good;

33 C. Brown goods at the rate of \$15 per brown
 good; and

35 D. Lead-acid batteries at the rate of \$1
37 per battery.

1 2. Imposition. The tax shall be imposed at
3 the time the distributor or unclassified
5 importer brings or causes to be brought into
7 this State tires, white goods, brown goods or
9 lead-acid batteries that are for sale to
 consumers or to retailers or for use at the time
 tires, white goods, brown goods or lead-acid
 batteries are manufactured or fabricated in this
 State for sale in this State.

11 3. Exclusion. The tax imposed on tires,
13 white goods, brown goods or lead-acid batteries
15 does not apply to those products exported from
17 this State or to any tires, white goods, brown
19 goods or lead-acid batteries which under the
21 laws of the United States may not be subject to
 taxation by this State. The tax imposed on
 tires does not apply to those tires which are
 remanufactured from used tires also known as
 "retreads" or "recaps."

23 §4834. Returns: payment of tax and penalty

25 Every distributor or unclassified importer,
27 on or before the last day of each month, shall
29 render, on forms to be furnished by the State
31 Tax Assessor, a report together with payment of
33 the tax due under this chapter to the State Tax
35 Assessor stating the quantity of all tires,
 white goods, brown goods or lead-acid batteries
 held, purchased, manufactured, brought in or
 caused to be brought in from outside the State
 or shipped or transported to retailers within
 the State during the preceding calendar month.
 Every distributor or unclassified importer shall
 keep a complete and accurate record at that
 distributor's or unclassified importer's
 principal place of business to substantiate all
 receipts of tires, white goods, brown goods or
 lead-acid batteries. This record shall be
 retained for a period of 2 years in such manner
 as to ensure permanency and accessibility for
 inspection.

1
3 The monthly reports must contain any further
5 information as the State Tax Assessor prescribes
7 and must show a credit for any tires, white
9 goods, brown goods or lead-acid batteries
11 exempted as provided in section 4833, subsection
13 3. Records must be maintained to substantiate
15 the exemption. Tires, white goods, brown goods
17 or lead-acid batteries previously taxed that are
19 returned to a manufacturer because the produce
21 has become unfit for use or unsalable may be
23 taken as a credit on a subsequent return upon
25 receipt of the credit notice from the original
27 supplier.

17 If the monthly report required by this
19 chapter is not filed, or payment is not rendered
21 by the last day of the month, the distributor or
23 unclassified importer is subject to a forfeiture
25 of \$1 a day for each day in arrears or 10% of
27 the tax liability, whichever is the greater,
29 together with interest at the rate of 1% per
31 month or the fraction of the interest due on
33 demand by the State Tax Assessor, and is
35 recoverable in a civil action. The State Tax
37 Assessor may waive the forfeiture for cause.

29 §4835. The State Tax Assessor may estimate
31 liability

31 Whenever a distributor or unclassified
33 importer neglects or refuses to file a report
35 required by this chapter or files an incorrect
37 or fraudulent report, the State Tax Assessor,
39 from such information as the State Tax Assessor
 may obtain, shall fix the amount of taxes,
 forfeitures and interest payable and proceed to
 collect the amount fixed.

1 " In an action or proceeding for collection of
3 the solid waste advance disposal fee, any
5 forfeitures and interest imposed in connection
7 with an assessment by the State Tax Assessor of
9 the tax, forfeiture or interest due the State
11 constitutes prima facie evidence of the claim of
13 the State. The burden of proof is on the
15 distributor or unclassified importer to show
17 that the assessment was incorrect and contrary
19 to law.

21 §4836. Disposition of taxes

The revenue derived from the tax imposed by
 this chapter shall be deposited in the General
 Fund less the costs incurred by the State Tax
 Assessor in collecting the tax.

 See also PACKAGING TAX

1 WPP97

3 COLUMN 1 LD 932
DEFINITIONS

5

7 NOTE: Counterpart below creates a new
definitions section that applies only to the
9 State Authority. The center column in contrast
takes the approach of making the DEP definitions
11 in Title 38 apply to both DEP and the Authority.

13

15

The following term applies only to Authority.
17 Shown here for comparison. Essentially existing
law except for an apparent typo (highlighted)

19

21 11. Disposal. "Disposal" means the
discharge, deposit, injection, dumping,
spilling, leaking or placing of any hazardous or
23 solid waste, sludge or septage into or on any
land or water so that the hazardous or solid
25 waste, sludge or septage or any constituent of
part of those waters may enter the environment,
27 be emitted into the air or discharged into any
waters, including ground waters.

29

31

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41

COLUMN 2 LD 1431
DEFINITIONS

Sec. 5. 38 MRSA §1303, first ¶, as repealed
and replaced by PL 1979, c. 383, §2, is repealed
and the following enacted in its place:

The following words when used in this
chapter or in chapter 24 shall have the
following meanings unless the context in which
they are used clearly shows a different meaning.

Sec. 6 38 MRSA §1303, sub-§3, as repealed
and replaced by PL 1979, c. 383, §2, is repealed
and the following enacted in its place:

3. Disposal. "Disposal" means the
discharge, deposit, dumping, incineration,
spilling, leaking or placing of any hazardous or
solid waste, refuse-derived fuel, sludge or
septage into or on any land, air or water so
that the hazardous or solid waste, sludge or
septage or any constituent thereof may enter the
environment or be emitted into the air, or
discharged into any waters, including ground
waters.

COLUMN 3 LD 1548
DEFINITIONS

Sec. 5. 38 MRSA §1303, sub-§3, as repealed
and replaced by PL 1979, c. 383, §2, is amended
to read:

3. Disposal. "Disposal" means the
discharge, deposit, combustion, burning,
incineration, injection, dumping, spilling,
leaking or placing of any hazardous or solid
waste, including any material derived from waste
for use as a fuel, or any sludge or septage into
or on any land or water or into the air so that
the hazardous or solid waste, sludge or septage
or any constituent thereof may enter the
environment or be emitted into the air, or
discharged into any waters, including ground
waters.

Sec. 6. 38 MRSA §1303, sub-§3-A, as enacted
by PL 1981, c. 528, §1, is repealed. Final
implementation of resource conservation or
resource recovery

Sec. 7. 38 MRSA §1303, sub-§10-A, as
enacted by PL 1981, c. 528, §1, is repealed.
Solid waste resource recovery or resource
conservation feasibility and design evaluation

Sec. 8. 38 MRSA §1303, sub-§11-B, as enacted by PL 1985, c. 822, §3, is repealed. Substantial expansion of a commercial landfill facility

Sec. 7. 38 MRSA §1303, sub-§§17 to 34, are enacted to read:

New terms 17 - 34

17. Authority. "Authority" means the Maine Solid Waste Management Authority established in section 2101.

18. Buyer. "Buyer" means a firm or operation purchasing recyclable materials for processing or end use.

19. Composting. "Composting" means the microbial degradation of organic matter into a useful product.

20. Curbside recycling. "Curbside recycling" means scheduled collection of recyclable materials placed at curbside by households.

21. Drop-off recycling center. "Drop-off recycling center" means a site where individuals can deliver separated recyclable materials for processing before recycling.

22. End user. "End user" means mills and other industrial facilities where recyclable materials are returned to economic markets in the form of raw materials, feedstocks or end products.

1 23. Incinerator. "Incinerator" means a
3 facility where solid waste or refuse-derived
5 fuel is disposed through combustion, including
7 combustion for the generation of electricity. A
 facility which combusts less than 2% solid waste
 or refuse-derived fuel on a heat input basis
 shall not be considered an incinerator.

9 24. Materials processing center.
11 "Materials processing center" means a facility
13 that separates mixed recyclable materials and
 processes the materials for sale to brokers or
 end users.

15 25. Recyclable materials. "Recyclable
17 materials" means materials that have served
19 their original intended use and are separated
21 from solid waste for reuse in manufacture and
23 for which a recycling collection, processing and
25 market system is functioning. The Director of
27 the Office of Waste Reduction and Recycling may,
29 through regulation, specify those materials that
 are to be included within the definition of
 recyclable materials. The materials to be
 included may change to reflect new technologies,
 economic conditions, characteristics of the
 waste stream, environmental effects or other
 factors.

31 26. Recycling. "Recycling" means the
33 collection, separation, recovery and sale or
35 reuse of metals, glass, paper, leaf waste,
37 plastics and other materials that would
39 otherwise be disposed of or processed as waste
 or the mechanized separation and treatment of
 waste, other than through combustion, and the
 creation and recovery of reusable materials
 other than as a fuel for the generation of
 electricity.

1 27. Refuse-derived fuel. "Refuse-derived
3 fuel" means solid waste which has been processed
 prior to combustion to increase the heat input
5 value of the waste.

7 28. Regional waste management district.
 "Regional waste management district" or
9 "district" means that entity established in
 section 2140.

11 29. Regional waste management plan.
 "Regional waste management plan" means a plan
13 adopted under chapter 24, subchapter IV, and may
 be referred to as "district plan" or "regional
15 plan."

17 30. Residual waste. "Residual waste" means
 waste resulting from the handling, processing,
19 disposal or recycling of solid waste including,
21 without limitation, front end waste and ash.

23 31. Source separation. "Source separation"
 means the preparation of materials for recycling
25 by separation from wastes at the point of
 generation.

27 32. State waste management and recycling
 plan. "State waste management and recycling
29 plan" means the plan adopted by the authority
 pursuant to chapter 24, subchapter II, and may
31 also be referred to as "state plan."

33 33. Yard waste. "Yard waste" means leaves,
 grass clippings and other organic wastes
35 produced as part of yard and garden development
 and maintenance.

37 34. Waste reduction. "Waste reduction"
39 means an action that reduces waste at the point
 of generation and may also be referred to as
41 "source reduction."

1

3

Sec. 4. 38 MRSa §1303, sub-§3-A, as enacted
5 by PL 1981, c. 528, §1, is amended to read:

7 3-A. Final implementation of resource
conservation or resource recovery. "Final
9 implementation of resource conservation or
resource recovery" means negotiating and
11 obtaining the contracts, agreements, financing,
permits and administrative framework necessary
13 to construct or procure a resource conservation
or resource recovery facility. ~~The Board of~~
15 ~~Environmental Protection is authorized to pay an~~
~~amount not in excess of 50% of the total~~
17 ~~eligible expenses incurred by a municipality or~~
~~quasi-municipal entity for the final~~
19 ~~implementation of solid waste resource~~
~~conservation or resource recovery or programs~~
21 ~~determined to be feasible by the Board of~~
~~Environmental Protection. Grants under this~~
23 ~~subsection can be used to cover development~~
~~costs or other reasonable one-time eligible~~
25 ~~costs. In addition, grants under this subsection~~
~~can be used to assist municipal and~~
27 ~~quasi-municipal recycling programs with capital~~
~~and one-time equipment costs.~~

29

31 ~~A. The board after public hearing shall~~
~~adopt criteria for the purpose of~~
~~establishing eligible costs.~~

33

35 ~~B. The board may adopt, amend and repeal~~
~~reasonable rules necessary for the proper~~
~~administration of the grant program~~
37 ~~authorized by this subsection and subsection~~
~~10-A.~~

39

~~C. In the event that there is a combination of federal and state grants that exceeds the total costs of the projects eligible for state assistance under this subsection or subsection 10-A, the Board of Environmental Protection may reduce the state's share by an amount equivalent to the amount in excess of the total costs of the project.~~

§1760-C. Definitions

As used in this Act, unless the context otherwise indicates, the following terms have the following meanings.

1. Authority. "Authority" means the Maine Solid Waste Management Authority established in section 1761-A. New term.

NOTE: repeated in §1303, sub-§1-D

2. Board. "Board" means the Board of Environmental Protection. Same as existing

3. Brown good. "Brown good" means an electronic device containing printed circuit boards, capacitors, resistors or transistors which is not included in the definition of white goods and which weighs more than 10 pounds. New term (for disposal fees)

4. Closing reserve fund. "Closing reserve fund" means a fund created for the purpose of financing the closing and maintenance after closing of a waste facility. New term

5. Commercial hazardous waste facility. "Commercial hazardous waste facility" means: Slightly different than existing law. Existing law does not use the word, "commercial" within the definition.

1 A. A commercial waste facility that handles
3 hazardous wastes generated off the site of
the facility; or

5 B. A commercial facility that, in the
handling of a waste generated off the site,
7 generates hazardous waste.

9 6. Commercial landfill facility.

Essentially existing law. Would also exempt
"district" facilities from definition of
commercial.

11 "Commercial landfill facility" means a privately
owned waste facility that accepts solid waste
for a fee or other consideration, that is used
13 for the burial of solid waste and that is used
for the disposal of waste other than waste
15 generated by its owners. "Commercial landfill
facility" does not include a waste facility
17 owned, controlled, operated or used exclusively
by:

19 A. A public waste disposal corporation
21 under section 1304-B, subsection 5;

23 B. A municipality under section 1305;

25 C. A refuse disposal district under chapter
17; or

27 D. A district, as provided for in this
29 chapter.

31 7. Commercial operator. "Commercial
operator" means any person owning or operating a
33 commercial waste facility, providing waste
disposal services, operating a solid waste
35 facility or providing waste disposal services
pursuant to a contract with the authority or a
37 district.

New term.

1 8. Commercial waste facility. "Commercial New term. Similar to sub-§6 above.
 2 waste facility" means a privately owned waste
 3 facility that accepts waste from another for
 4 consideration and is used for the management of
 5 waste generated by persons who do not own or
 6 operate the facility. The term does not include
 7 a waste facility owned, controlled, operated or
 8 used exclusively by:

- 9
- 10 A. A public waste disposal corporation;
 - 11
 - 12 B. A municipality;
 - 13
 - 14 C. A refuse disposal district; or
 - 15
 - 16 D. A district, as provided in this chapter.
 - 17

18 9. Contingency reserve fund. "Contingency New term.
 19 reserve fund" means a fund maintained for the
 20 purpose of meeting unexpected contingencies in
 21 the operation of a waste facility.

22 10. Department. "Department" means the Existing law.
 23 Department of Environmental Protection and
 24 includes the Board of Environmental Protection.

25 11. Disposal. "Disposal" means the Existing law with apparent type (highlighted)
 26 discharge, deposit, injection, dumping,
 27 spilling, leaking or placing of any hazardous or
 28 solid waste, sludge or septage into or on any
 29 land or water so that the hazardous or solid
 30 waste, sludge or septage or any constituent of
 31 part of those waters may enter the environment,
 32 be emitted into the air or discharged into any
 33 waters, including ground waters.

34 12. District. "District" means a solid New term.
 35 waste management district pursuant to subchapter
 36 II.

- 1 13. Fee. "Fee means the amount charged by New term.
 3 the owner or operator of waste disposal
facilities or services to the users of the
 5 facilities or services.
- 7 14. Generation. "Generation" means the act Existing law. "Special" waste is explicitly
 9 or process of producing hazardous, special or added consistent with current practice.
solid waste, sludge or septage.
- 11 15. Handle. "Handle" means to store, Essentially existing law (adds "wastes" to end
 13 transfer, collect, separate, salvage, process, of sentence.
reduce, recover, incinerate, treat or dispose of
wastes.
- 15 16. Hazardous waste. "Hazardous waste" Essentially existing law.
 17 means a waste substance or material, in any
 19 physical state, designated as hazardous by the
board under section 1319-0. Hazardous waste
 21 does not include waste resulting from normal
household or agricultural activities. The fact
 23 that a hazardous waste or constituent part of
hazardous waste may have value or other use or
may be sold or exchanged does not exclude it
from this definition.
- 25 17. Host community. "Host community" means New term.
 27 the municipality or the division of the
unorganized territory in which a waste facility
 29 is located.
- 31 18. Host region. "Host region" means the New term.
 33 district or districts, pursuant to section
1762-A, in which a waste facility is located.
- 35 19. Lead-acid battery. "Lead-acid battery" New term (for disposal fees).
 37 means a device designed and used for the storage
of electrical energy through chemical reactions
involving lead and acids.
- 39

1 20. Municipal solid waste landfill. Existing law (§1310-C).

2 "Municipal solid waste landfill" means a solid
3 waste landfill owned by a municipality or group
4 of municipalities.

5
6 21. Office. "Office" means the Office of New term.

7 Recycling and Waste Reduction pursuant to
8 section 1764-A.

9
10 22. Recycling. "Recycling" means the New term.

11 collection, separation, recovery and sale or
12 reuse of metals, glass, paper, leaf waste,
13 plastics and other materials that would
14 otherwise be disposed of or processed as waste
15 or the mechanized separation and treatment of
16 waste, other than through combustion, and the
17 creation and recovery of reusable materials
18 other than as a fuel for the generation of
19 energy.

20
21 23. Recycling facility. "Recycling New term.
22 facility" means any waste facility utilized to
23 separate or process waste into marketable
24 material.

25
26 24. Resource conservation. "Resource Existing law.
27 conservation" means the reduction of the amount
28 of waste generated, the reduction of overall
29 resource consumption and the utilization of
30 recovered resources.

31
32 25. Resource recovery. "Resource recovery" Existing law.
33 means the recovery of materials or substances
34 that still have useful physical or chemical
35 properties after serving a specific purpose and
36 can be reused or recycled for the same or other
37 purposes.

1 26. Septage. "Septage" means waste, Existing law.
 refuse, effluent, sludge and any other materials
 3 from septic tanks, cesspools or any other
 similar facilities.

5 27. Site. "Site" means the same or Essentially existing law.
 7 geographically contiguous property which may be
 divided by a public or private right-of-way,
 9 provided that the entrance and exit between the
 properties is at a crossroads intersection and
 11 access is by crossing as opposed to going along
 the right-of-way. Noncontiguous properties
 13 owned by the same person but connected by a
 right-of-way which that person controls and to
 15 which the public does not have access is
 included in the definition of "site."

17 28. Solid waste. "Solid waste" means Existing law plus new last sentence. This new
 19 useless, unwanted or discarded solid material sentence tracks existing provisions of other
 with insufficient liquid content to be waste definitions.
 21 free-flowing including, but not limited to,
 rubbish, garbage, scrap materials, junk, refuse,
 23 inert fill material and landscape refuse, but
 does not include septic tank sludge or
 25 agricultural wastes. The fact that a solid
 waste or constituent of the waste may have value
 27 or other use or may be sold or exchanged does
 not exclude it from this definition.

29 29. Solid waste facility. "Solid waste New term.
 31 facility" means a waste facility used for the
 handling of solid waste.

33 30. Solid waste landfill. "Solid waste New term.
 35 landfill" means a waste facility for the
 permanent disposal of solid waste on or in
 37 land. This term does not include land spreading
 sites used in programs approved by the
 39 department.

1 31. Special waste. "Special waste" means Essentially existing law.
 2 any nonhazardous waste generated by sources
 3 other than domestic and typical commercial
 4 establishments that exists in such unusual
 5 quantity, chemical state or physical state, or
 6 any combination of these states, as may disrupt
 7 or impair effective waste management, threaten
 8 the public health, human safety or the
 9 environment and require special handling,
 10 transportation and disposal procedures. Special
 11 waste includes, but is not limited to:

13 A. Oil, coal, wood and multifuel boiler and
 14 incinerator ash;

16 B. Industrial and industrial process waste;

17 C. Wastewater treatment plant sludge,
 18 papermill sludge and other solid waste;

21 D. Debris and residuals from nonhazardous
 22 chemical spills and the clean-up residuals
 23 of those spills;

25 E. Contaminated soils and dredge spoils;

27 F. Asbestos and asbestos-containing wastes;

29 G. Sandblasting grit and nonliquid paint
 30 waste;

31 H. Medical and other biological waste not (Check LD previously passed this session)
 32 identified under section 1319-0, subsection
 33 1, paragraph A, subparagraph (4);

35 I. High and low pH waste;

37 J. Spent filter media and residue; and

39 K. Other waste designated by the board. (existing law says ",by rule")
 41

- 1 32. Storage. "Storage" means the Existing law applies only to hazardous waste.
containment of hazardous solid wastes, sludge or
3 septage, either on a temporary basis or for a
period of years, in a manner that does not
5 constitute disposal of the wastes.
- 7 33. Substantially expand. "Substantially Existing law applies only to hazardous waste.
expand" means the expansion of an existing
9 licensed waste facility by more than 25%, as
measured by volume of waste or affected land
11 area, from the date of its initial licensed
operation.
- 13 34. Tire. "Tire" means a device made of New term (for disposal fees).
15 rubber or any similar substance that is intended
to be attached to a motorized vehicle or trailer
17 and is designed to support the load of the motor
vehicle or trailer.
- 19 35. Transport. "Transport" means the Essentially existing law less the provisions for
21 movement of hazardous or solid waste, sludge or waste oil.
septage from the point of generation to any
23 intermediate point and finally to the point of
ultimate disposition. Movement of the waste on
25 the site where it is generated or on the site of
a licensed waste facility is not "transport."
- 27 36. Waste disposal services. "Waste New term.
29 disposal services" means the provision of
services relating to the operation of hazardous
31 or solid waste facilities or the transportation
of solid or hazardous waste.
- 33 37. Waste facility. "Waste facility" means Existing law except that generator-owned
35 any land area, structure, location, equipment or facilities are excluded from the definition.
a combination of them, including dumps used for
37 handling hazardous or solid waste, sludge or
septage. Except as otherwise provided in this
39 Act, this term does not include a facility that
treats, stores or disposes of solid and special
41 wastes generated by the owner or operator of the
facility, regardless of whether the facility is

1 at the site of generation or distant from it. A
2 land area or structure is not a waste facility
3 solely because it is used:

5 A. By its owner for disposing septage from
6 the owner's residence;

7
8 B. To store hazardous waste generated on
9 the same premises for 90 days or less;

11 C. By individual homeowners or lessees to
12 burn leaves, brush, deadwood and tree
13 cuttings accrued from normal maintenance of
14 their residential property, when burning is
15 permitted under section 599, subsection 3; or

17 D. By its residential owner to burn highly
18 combustible domestic, household trash such
19 as paper, cardboard cartons or wood boxes,
20 when burning is permitted under section 599,
21 subsection 3.

23 38. Waste management. "Waste management" Existing law.
24 means purposeful, systematic and unified control
25 of the handling and transportation of hazardous
26 or solid waste, sludge or septage.

27
28 39. White good. "White good" means any New term (for disposal fees).
29 appliance employing electricity, natural gas or
30 any liquified petroleum gas to supply heat or
31 motive power;

33 A. To preserve or cook food;

35 B. To wash clothing, dishes, kitchen
36 utensils, glasses or other related items; or

37
38 C. To cool or heat air or water.

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